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MK 7603

MK 7600
TEMPERATURE CHAMBER
MANUAL

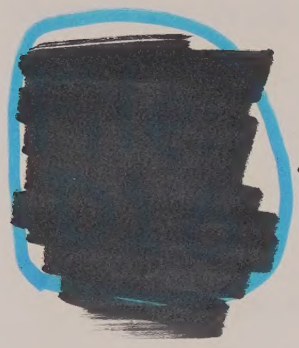
QUALITY CONTROL

DELTA DESIGN
INC.

[redacted]

LA MESA, CALIFORNIA

QUALITY ASSURANCE
STANDARDS, CALIBRATION, AND
MAINTENANCE LAB.



MK 7603

MK 7600
TEMPERATURE CHAMBER
MANUAL

QUALITY CONTROL

This Manual, with supplementary enclosures, is applicable to the following temperature chambers:

MK 3900-H

MK 6300-F

MK 7600

8000 Fletcher Parkway La Mesa, California

Telephone: 714 465 4141
TWX: 714 582 0790
Cable: Delta

QUALITY ASSURANCE
STANDARDS, CALIBRATION, AND
MAINTENANCE LAB.

QUALITY CONTROL

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D E L T A D E S I G N I N C.

La Mesa, California

MK-6300-H CHAMBER

PRECAUTIONS

(1) Connect SAFETY PLUG (rear of chamber) when external programmer is not being used. This will preclude any accidental high temperature being obtained if the MODE Switch is placed in the PROGRAM position with no programmer connected.

(2) Unplug the chamber from all sources of power before attempting removal of the controller chassis. The case of the SCR Switch assembly is at power line potential and extreme care in servicing or calibration must be exercised.

(3) Do not block the inlet of the vent fan (right side of chamber) or outlet of controller area on bottom of the chamber (right side) as forced draft cooling is required for proper operation of the unit.

(4) Insure that the correct type of LCO_2 (liquid carbon dioxide) source is connected to the chamber before operating at low temperature. Test the LCO_2 for cleanliness by discharging a quantity of it through a clean white hankerchief. Bits of rust or traces of oil indicate contaminated LCO_2 which should not be used. Ice or water show the presence of water and therefore LCO_2 which should not be used.

(5) Ground the case of the chamber to earth ground. When a grounded outlet is not available, use the three to two adapter (supplied with the chamber) and connect the green colored "pigtail" to earth ground. The chamber must not be operated without the case grounded.

(6) Operate the chamber at a temperature of 400°F for a hour after prolonged operation at low temperatures. This restores the efficiency of the insulating material by driving out the moisture which has been condensed out of the air.

(7) CAUTION - Liquid oxygen may be formed in the insulation when the chamber is operated at temperatures of -297°F and below. Any mixture of oil and liquid oxygen can be explosive. If oil contamination is suspected, bake the chamber out by operating it at a temperature of 400°F for a period of 3 hours before taking it to extremely low temperatures.

(8) Do not leave liquid nitrogen trapped in a line (valves closed at both ends) as high pressures will be developed as the liquid absorbs heat and becomes gas.

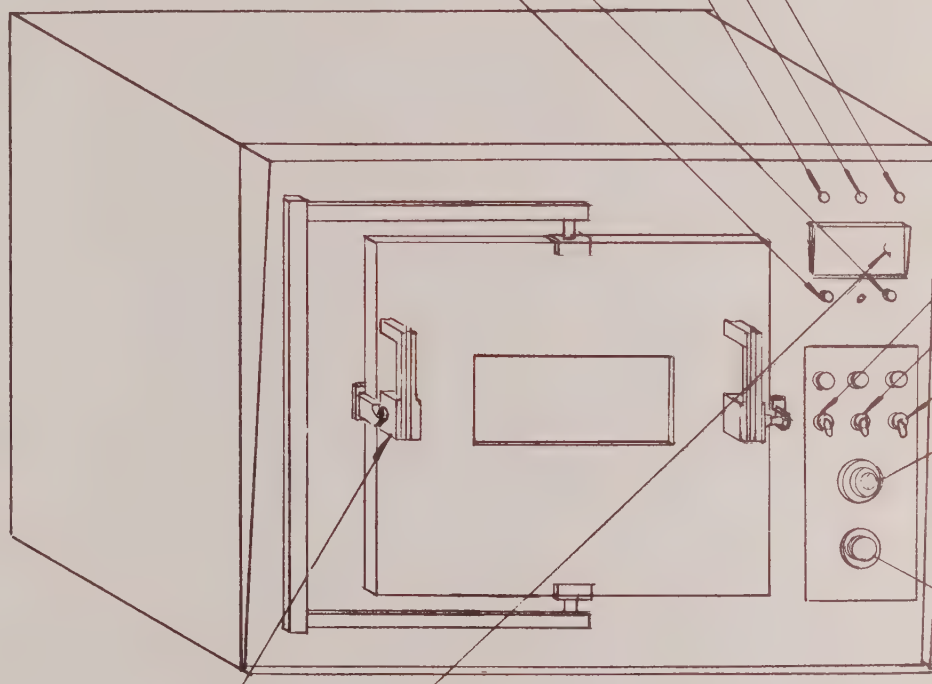
HEAT SW. SELECTS FULL OR HALF HEAT

RESET SW. (MOMENTARY) RESTORES POWER TO HEAT OR COOL CIRCUIT.

FAILSAFE LAMP - GLOW RED WHEN FAILSAFE IS TRIPPED

HIGH TEMPERATURE FAILSAFE SET POINT

LOW TEMPERATURE FAILSAFE SET POINT.



CAM ACTION HANDLES PULL LEVER FULL DOWN TO RELEASE.

PYROMETER: INDICATES TEMPERATURE IN CHAMBER

OPERATING INSTRUCTIO
INSTALL THE CHAMBER,
CONNECT POWER CORD TO
SUITABLE OUTLET & COOLAN
TO VALVE INLET AT REAR O
CHAMBER AS DESCRIBED
PAGE THROUGH

FOLLOW THE ARROWS

5 (HEAT SWITCH & LIGHT)-- SWITCH ON. ON POSITION ALLOWS CONTROLLER TO APPLY HEAT AUTOMATICALLY TO MAINTAIN SELECTED TEMPERATURE IN CHAMBER. RED LIGHT IS ON STEADY WHEN CHAMBER IS HEATING. BLINKS WHEN CHAMBER REACHES SELECTED TEMPERATURE ABOVE AMBIENT.

4 (COOL SWITCH & LIGHT)- SWITCH ON. ON POSITION ALLOWS CONTROLLER TO APPLY COOLANT AUTOMATICALLY TO MAINTAIN SELECTED TEMPERATURE IN CHAMBER. GREEN LIGHT IS ON STEADY WHEN CHAMBER IS COOLING.

3 (POWER SWITCH & LIGHT) SWITCH ON. MAIN POWER ON-OFF SWITCH WHITE LIGHT GLOWS WHEN POWER IS ON.

2 (TEMPERATURE SET DIAL)-- SET TO DESIRED TEMPERATURE. SELECTS CHAMBER TEMPERATURE IF MODE SWITCH IS IN MANUAL POSITION.

1 (MODE SWITCH)-- SET TO MANUAL POSITION. ASSIGNS THE SELECTION OF CHAMBER TEMPERATURE TO TEMPERATURE SET DIAL OR EXTERNAL PROGRAMMER.
(MANUAL POSITION): TEMPERATURE SET DIAL DETERMINES CHAMBER TEMPERATURE.
(PROGRAM POSITION:) PROGRAMMING RESISTANCE CONNECTED TO PROGRAM JACK AT REAR OF UNIT SELECTS CHAMER TEMPERATURE.
(CAUTION) ALWAY CONNECT SAFETY PLUG (AT REAR OF CHAMBER) WHEN AN EXTERNAL PROGRAMMER IS NOT BEING USED.

FIG. 1. PAGE 2

MK 6300-H SPECIFICATION SHEET

TEST AREA DIMENSION: 12" x 20" x 16"

OUTSIDE CASE DIMENSION: 24 1/16" x 36 1/4" x 32 1/8"

AIR CIRCULATION: Two 140 CFM centrifugal blowers with baffling to provide equal distribution throughout the chamber in a vertical air flow pattern.

INNER LINER: Type 302 Stainless Steel

OUTER CASE: Aluminum

EXTERNAL FINISH: Grey, pebble enamel

INSULATION: Banroc

WEIGHT: 127 lbs.

POWER REQUIREMENT: 6.7 KW, 240V 60 cycle single phase AC.

CONTROLS: Power ON-OFF switch and indicator light, COOL ON-OFF switch and indicator light, HEAT ON-OFF switch and indicator light, temperature set point control, local or remote control switch (Mode), HALF-FULL heat switch, HI & LO Failsafe temperature set, RESET SWITCH and lamp.

HEATING ELEMENTS: Eight 17.5 ohm elements to give total of 6500 Watts, nichrome wire.

COOLING: Liquid CO_2 metered injection (900 psi standard, 300 psi optional) or liquid nitrogen.

PROGRAMMING: Chamber requires no modification.

TEMPERATURE RANGE: -300°F to +1000°F.

RESETABILITY: ± 0.25°F.

TEMPERATURE DEVIATION: ± 0.2°F.

CONTROLLER DEAD BAND: 3°F.

LINE VOLTAGE STABILIZATION: ± 0.25°F for 105 to 125V, AC 60 cycle line voltage change.

AMBIENT TEMPERATURE COMPENSATION: ±0.010°F/°F

HEAT LOAD COMPENSATION: ±0.040°F/Watt

GRADIENT IN TEST AREA (1 1/2" from walls in corners and in the center of the test area): ± 1°F/100°F difference, measured from ambient

HEATING RATE: See Fig. 2

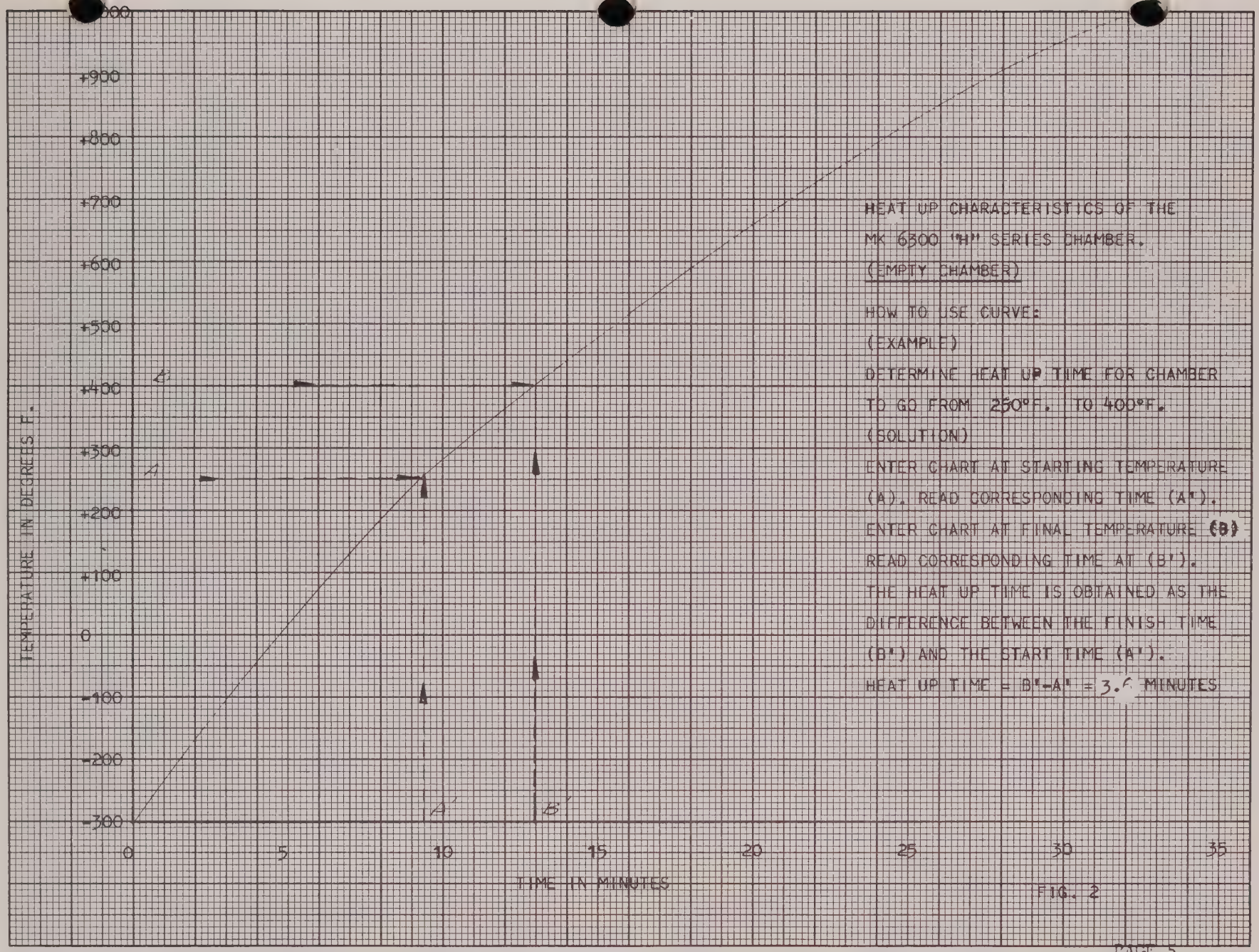
COOLING RATE: See Fig. 4

LN_2 CONSUMPTION: See Fig. 4

THERMAL IMPEDANCE OF CHAMBER: Approximately 0.85°F/watt

NULL DETECTOR CONTACT CLOSURE: Temperature will be within 4°F of final temperature at 3 min. after closure occurs. (425°F from ambient start)

NULL DETECTOR CONTACT RATING: 1 amp, 240 V, with contact protection provided by user to protect against inductive loads.



HEAT UP CHARACTERISTICS OF THE MK 6300 "H" SERIES CHAMBER.

(EMPTY CHAMBER)

HOW TO USE CURVE:

(EXAMPLE)

DETERMINE HEAT UP TIME FOR CHAMBER TO GO FROM 250°F. TO 400°F.

(SOLUTION)

ENTER CHART AT STARTING TEMPERATURE (A). READ CORRESPONDING TIME (A'). ENTER CHART AT FINAL TEMPERATURE (B) READ CORRESPONDING TIME AT (B'). THE HEAT UP TIME IS OBTAINED AS THE DIFFERENCE BETWEEN THE FINISH TIME (B') AND THE START TIME (A').

HEAT UP TIME = B'-A' = 3.6 MINUTES

FIG. 2

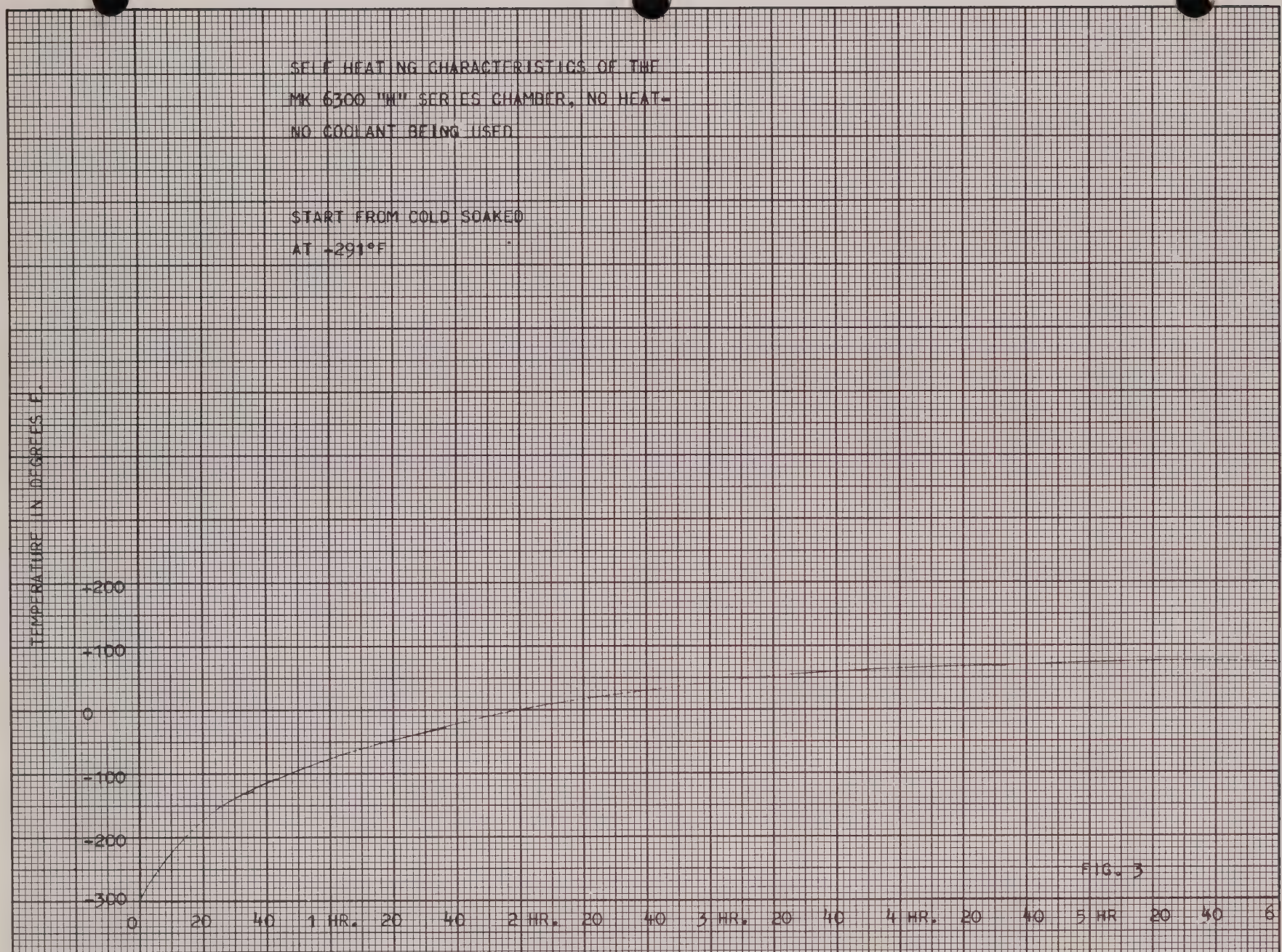

SELF HEATING CHARACTERISTICS OF THE
MK 6300 "W" SERIES CHAMBER, NO HEAT-
NO COOLANT BEING USED
START FROM COLD SOAKED
AT +291°F
TEMPERATURE IN DEGREES F.
+200
+100
0
-100
-200
-300
0
20
40
1 HR.
20
40
2 HR.
20
40
3 HR.
20
40
4 HR.
20
40
5 HR
20
40
6 HR.
TIME IN MINUTES

FIG. 3

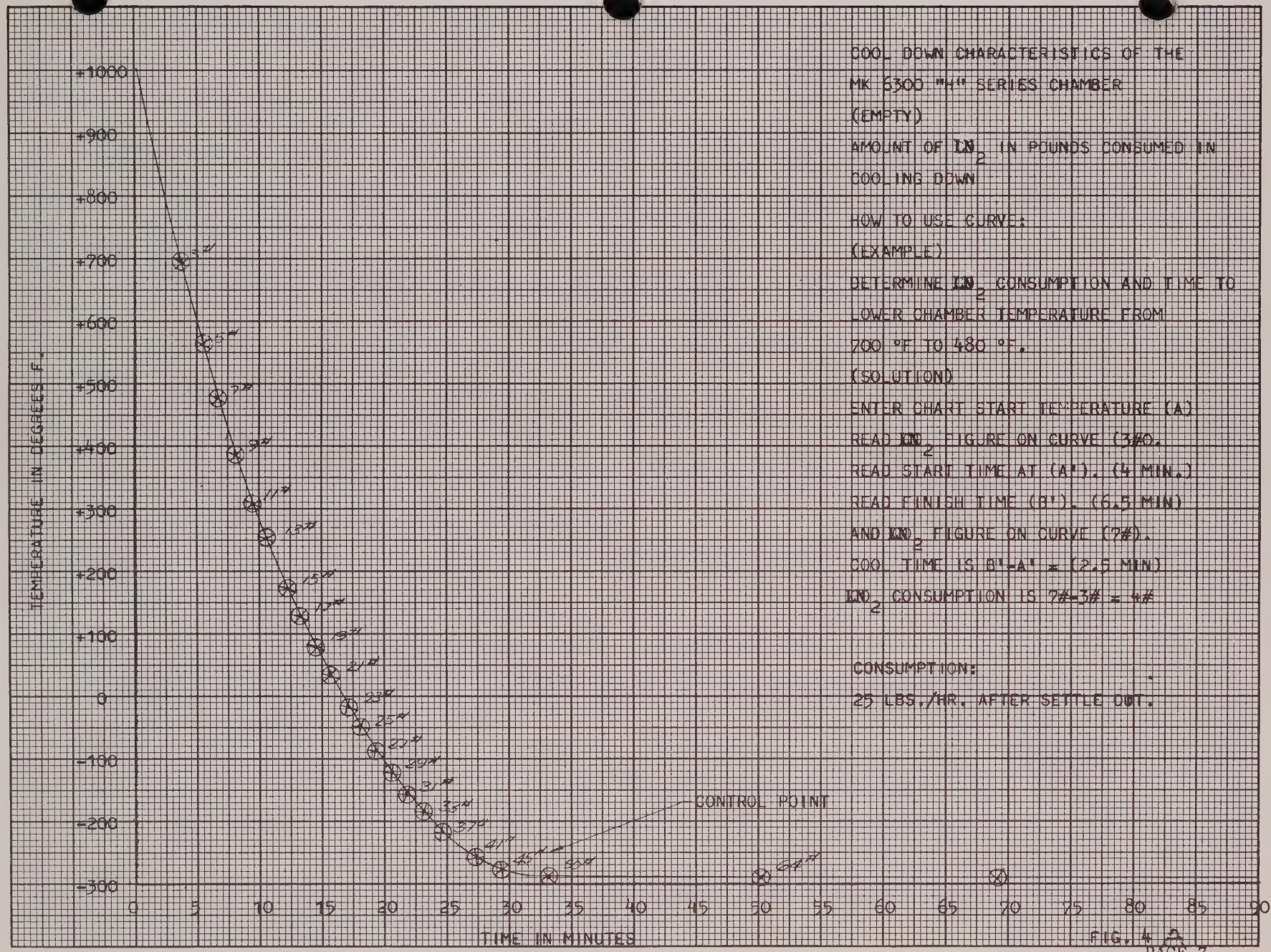

COOL DOWN CHARACTERISTICS OF THE
MK 6300 "H" SERIES CHAMBER
(EMPTY)
AMOUNT OF LN_2 IN POUNDS CONSUMED IN
COOLING DOWN
HOW TO USE CURVE:
(EXAMPLE)
DETERMINE LN_2 CONSUMPTION AND TIME TO
LOWER CHAMBER TEMPERATURE FROM
700 °F TO 480 °F.
(SOLUTION)
ENTER CHART START TEMPERATURE (A)
READ LN_2 FIGURE ON CURVE (3#0.
READ START TIME AT (A'). (4 MIN.)
READ FINISH TIME (B'). (6.5 MIN)
AND LN_2 FIGURE ON CURVE (7#).
COOL TIME IS B'-A' = (2.5 MIN)
LN_2 CONSUMPTION IS 7#-3# = 4#
CONSUMPTION:
25 LBS./HR. AFTER SETTLE OUT.
TEMPERATURE IN DEGREES F.
+1000
+900
+800
+700
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
TIME IN MINUTES
CONTROL POINT

FIG. 4

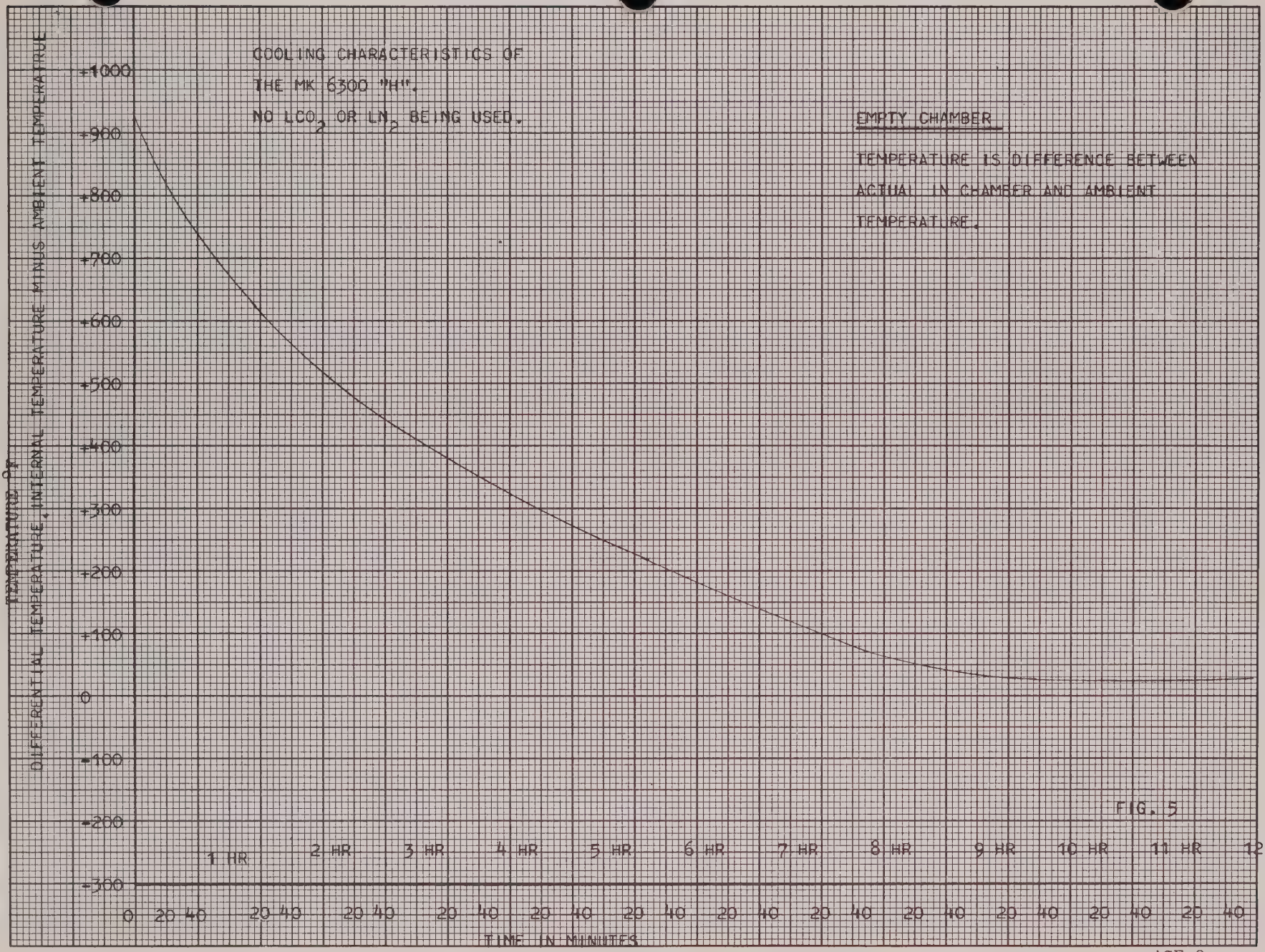

COOLING CHARACTERISTICS OF
THE MK 6300 "H".
NO LCO_2 OR LN_2 BEING USED.
EMPTY CHAMBER
TEMPERATURE IS DIFFERENCE BETWEEN
ACTUAL IN CHAMBER AND AMBIENT
TEMPERATURE.
DIFFERENTIAL TEMPERATURE, INTERNAL TEMPERATURE MINUS AMBIENT TEMPERATURE
TEMPERATURE °F
+1000
+900
+800
+700
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
1 HR
2 HR
3 HR
4 HR
5 HR
6 HR
7 HR
8 HR
9 HR
10 HR
11 HR
12 HR
0 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40
TIME IN MINUTES

FIG. 5

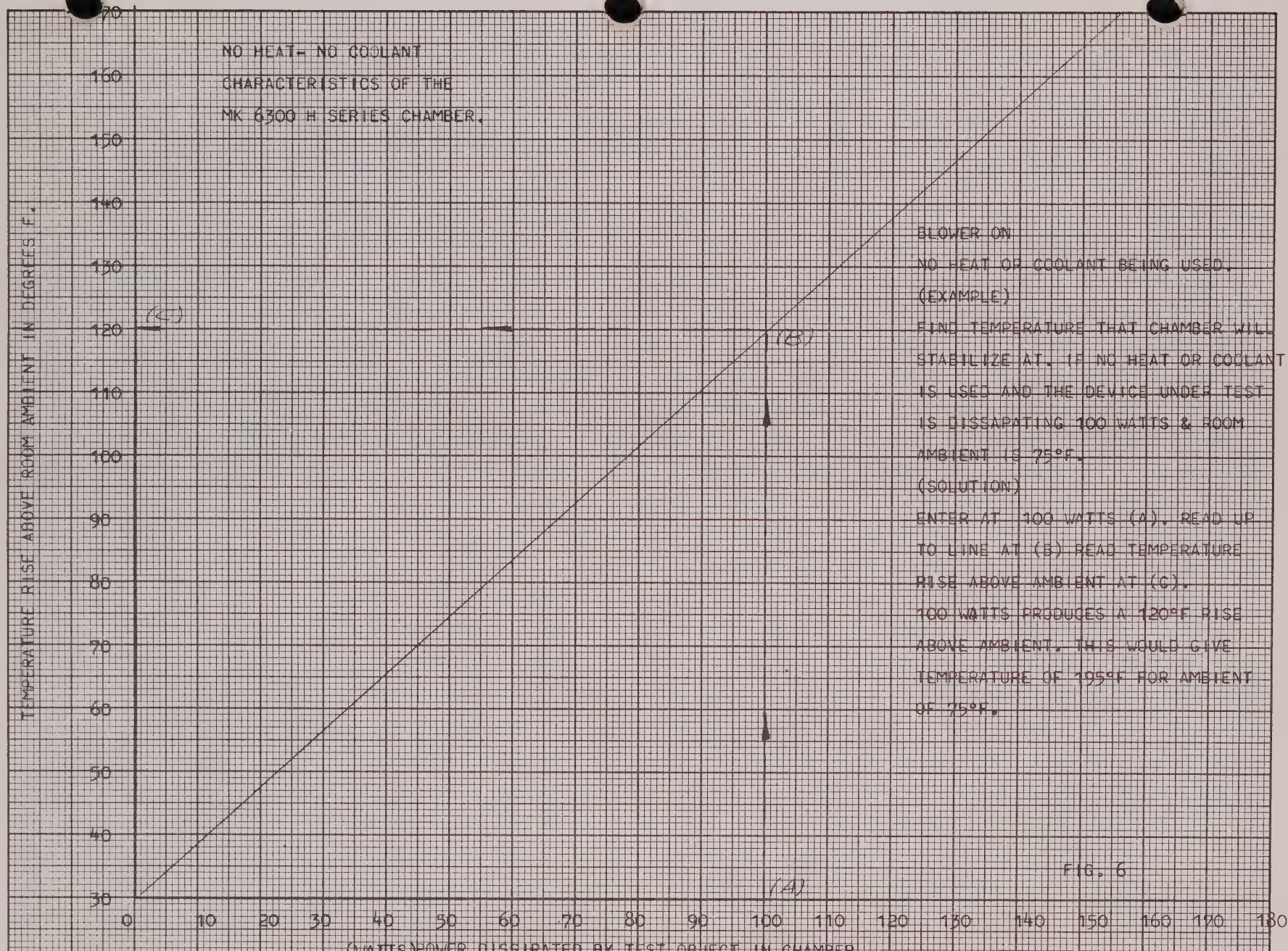

NO HEAT- NO COOLANT
CHARACTERISTICS OF THE
MK 6300 H SERIES CHAMBER.
BLOWER ON
NO HEAT OR COOLANT BEING USED.
(EXAMPLE)
FIND TEMPERATURE THAT CHAMBER WILL STABILIZE AT, IF NO HEAT OR COOLANT IS USED AND THE DEVICE UNDER TEST IS DISSAPATING 100 WATTS & ROOM AMBIENT IS 75°F.
(SOLUTION)
ENTER AT 100 WATTS (A), READ UP TO LINE AT (B) READ TEMPERATURE RISE ABOVE AMBIENT AT (C).
100 WATTS PRODUCES A 120°F RISE ABOVE AMBIENT. THIS WOULD GIVE TEMPERATURE OF 195°F FOR AMBIENT OF 75°F.
(C)
(B)
(A)
TEMPERATURE RISE ABOVE ROOM AMBIENT IN DEGREES F.
(WATTS) POWER DISSIPATED BY TEST OBJECT IN CHAMBER
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170

FIG. 6

EXAMPLES OF DIAL INDICATION FOR VARIOUS TEMPERATURES:

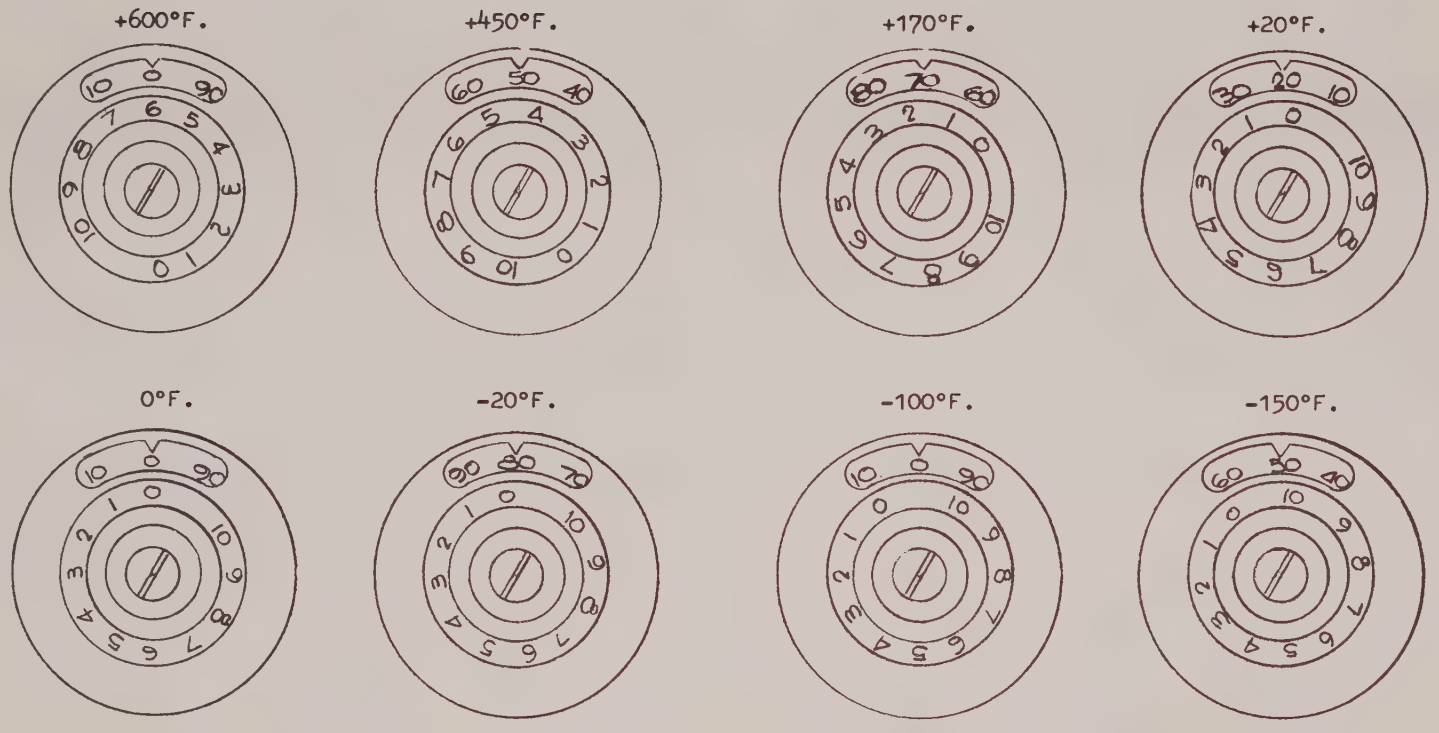
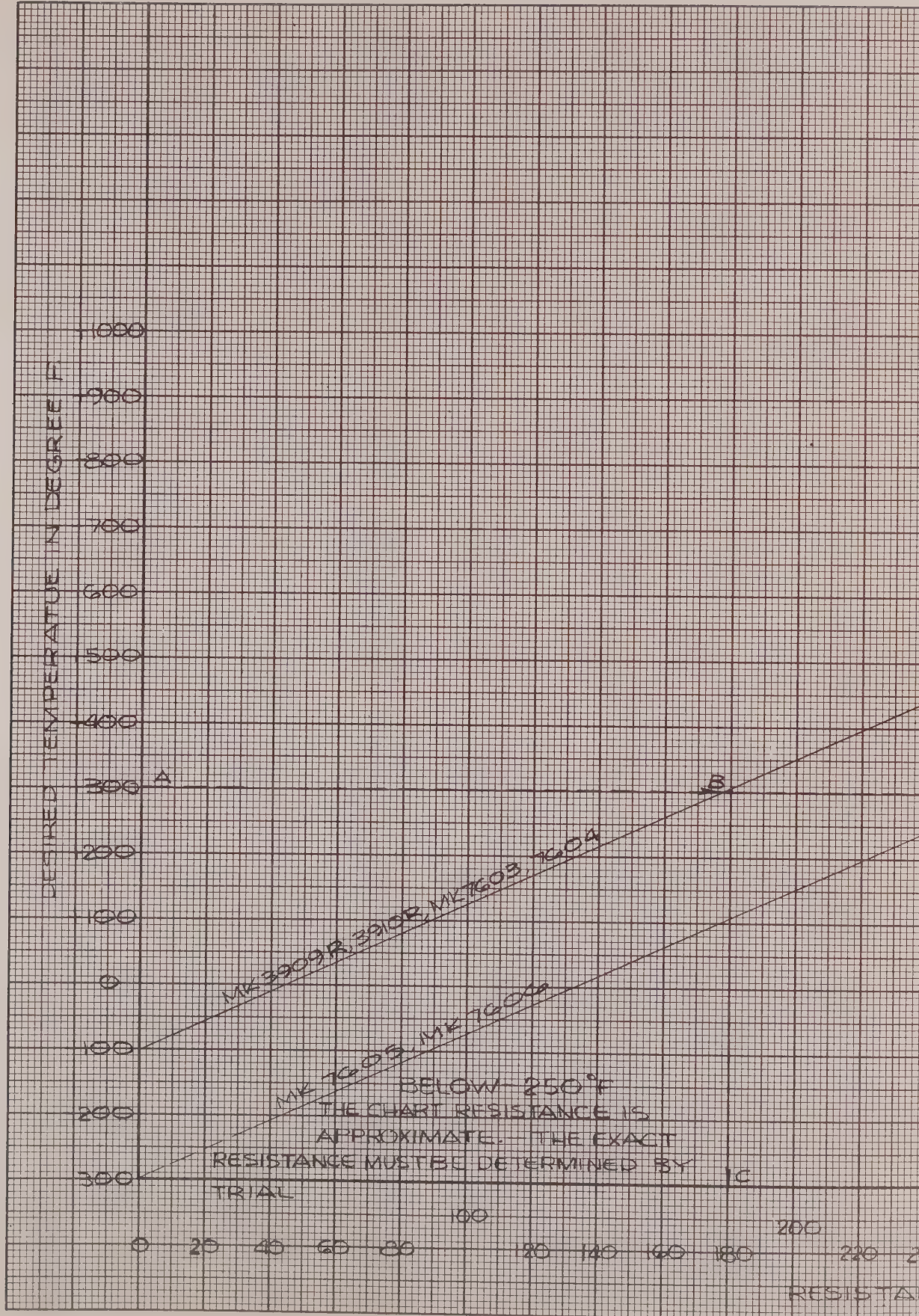
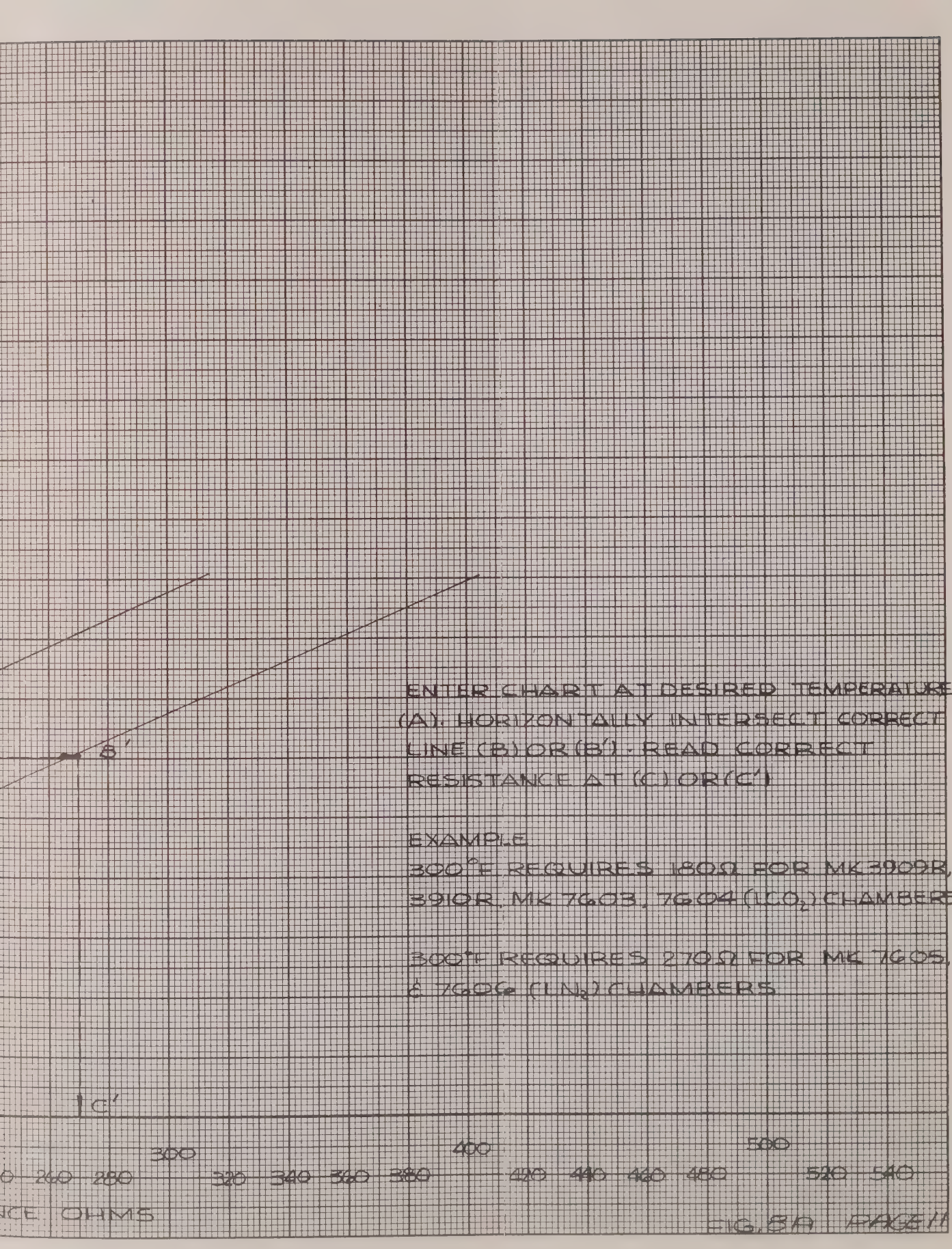


FIG. 7


DESIRED TEMPERATURE IN DEGREE F
1000
900
800
700
600
500
400
300
200
100
0
100
200
300
A
B
C
MK-3903B, 3910B, MK-1603, 1604
MK-1605, MK-1606
BELOW 250°F
THE CHART RESISTANCE IS
APPROXIMATE. THE EXACT
RESISTANCE MUST BE DETERMINED BY
TRIAL
0
20
40
60
80
100
120
140
160
180
200
220
RESISTA



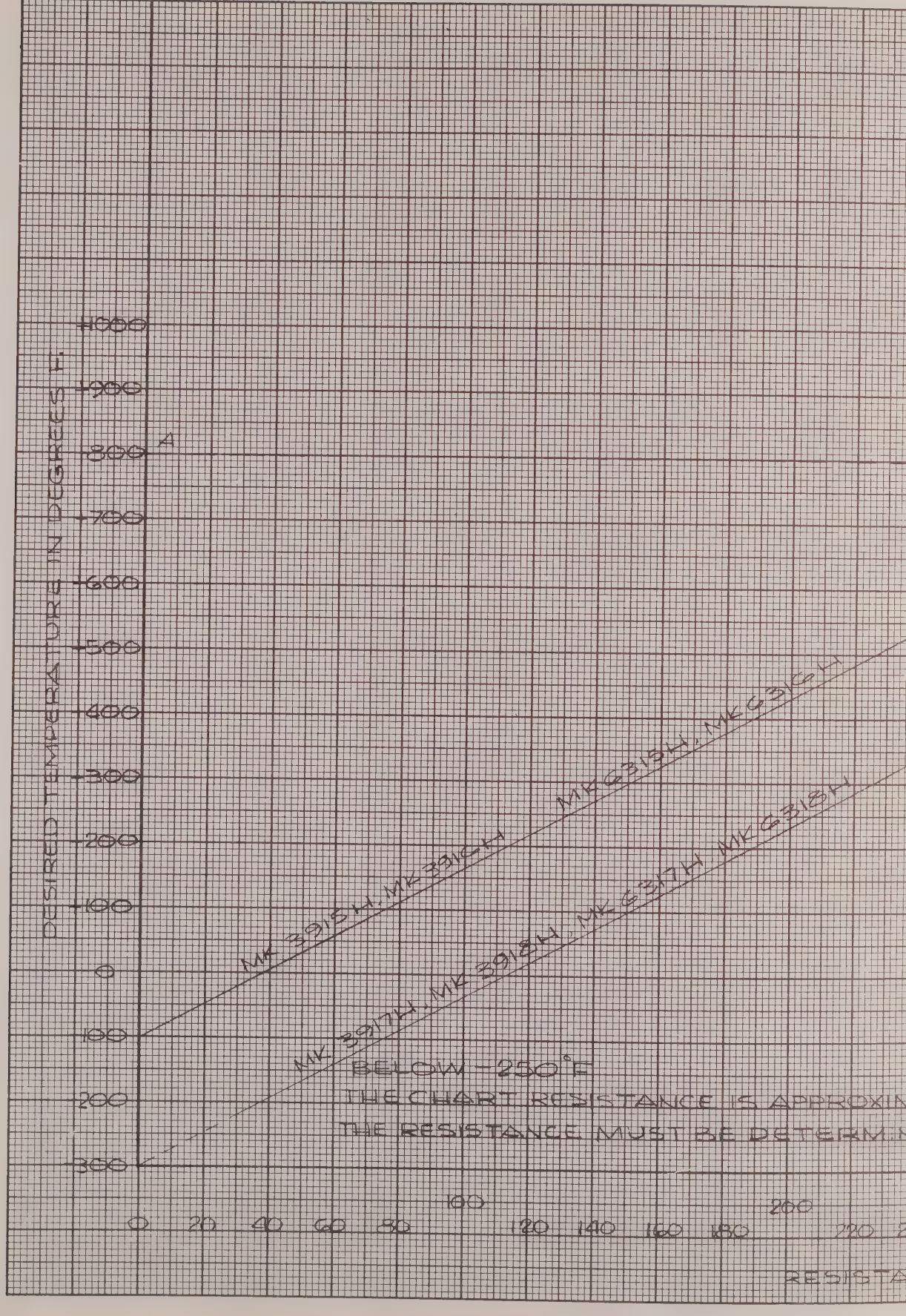
ENTER CHART AT DESIRED TEMPERATURE (A). HORIZONTALLY INTERSECT CORRECT LINE (B) OR (B'). READ CORRECT RESISTANCE AT (C) OR (C')

EXAMPLE

300°F REQUIRES 180Ω FOR MK 3909B, 3910B, MK 7603, 7604 (LCO_2) CHAMBERS

300°F REQUIRES 270Ω FOR MK 7605, & 7606 (LN_2) CHAMBERS

FIG. 8A PAGE 11


DESIRED TEMPERATURE IN DEGREES F.
+1000
+900
+800
+700
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
A
MK 391 H, MK 391 H, MK 391 H
MK 391 H, MK 391 H, MK 391 H
MK 391 H, MK 391 H, MK 391 H
BELOW -250°F
THE CHART RESISTANCE IS APPROXIM
THE RESISTANCE MUST BE DETERM
0
20
40
60
80
100
120
140
160
180
200
220
RESISTA

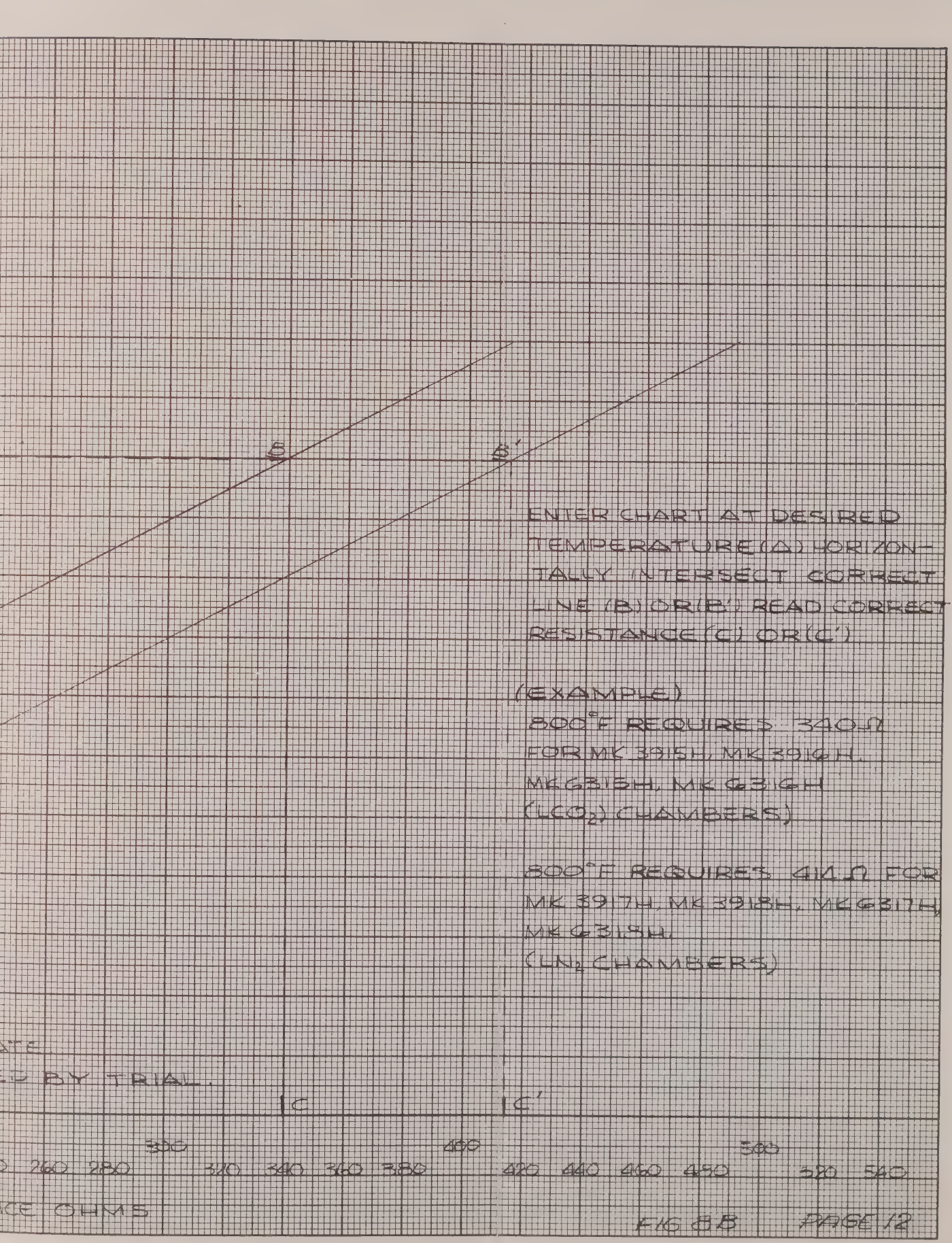
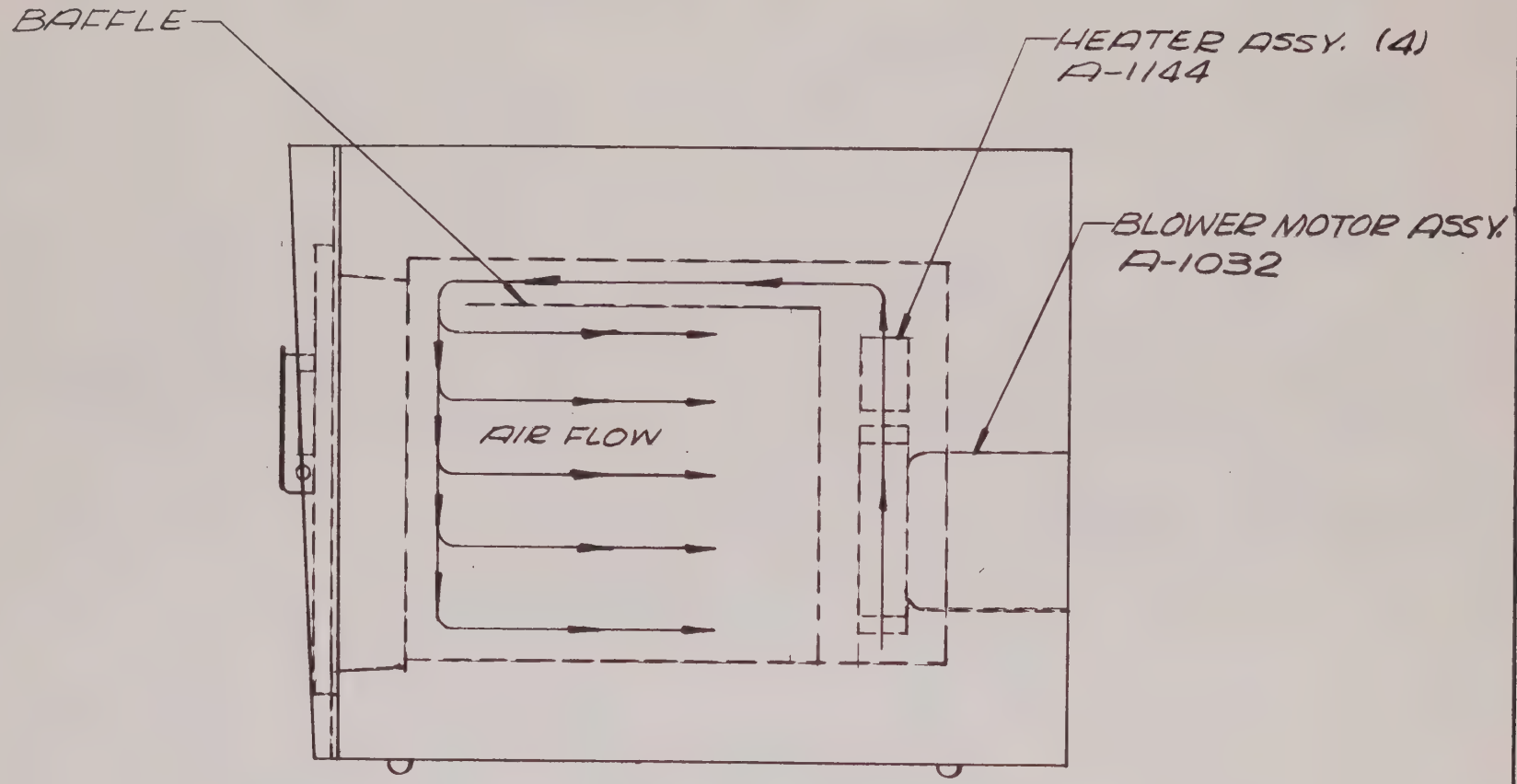
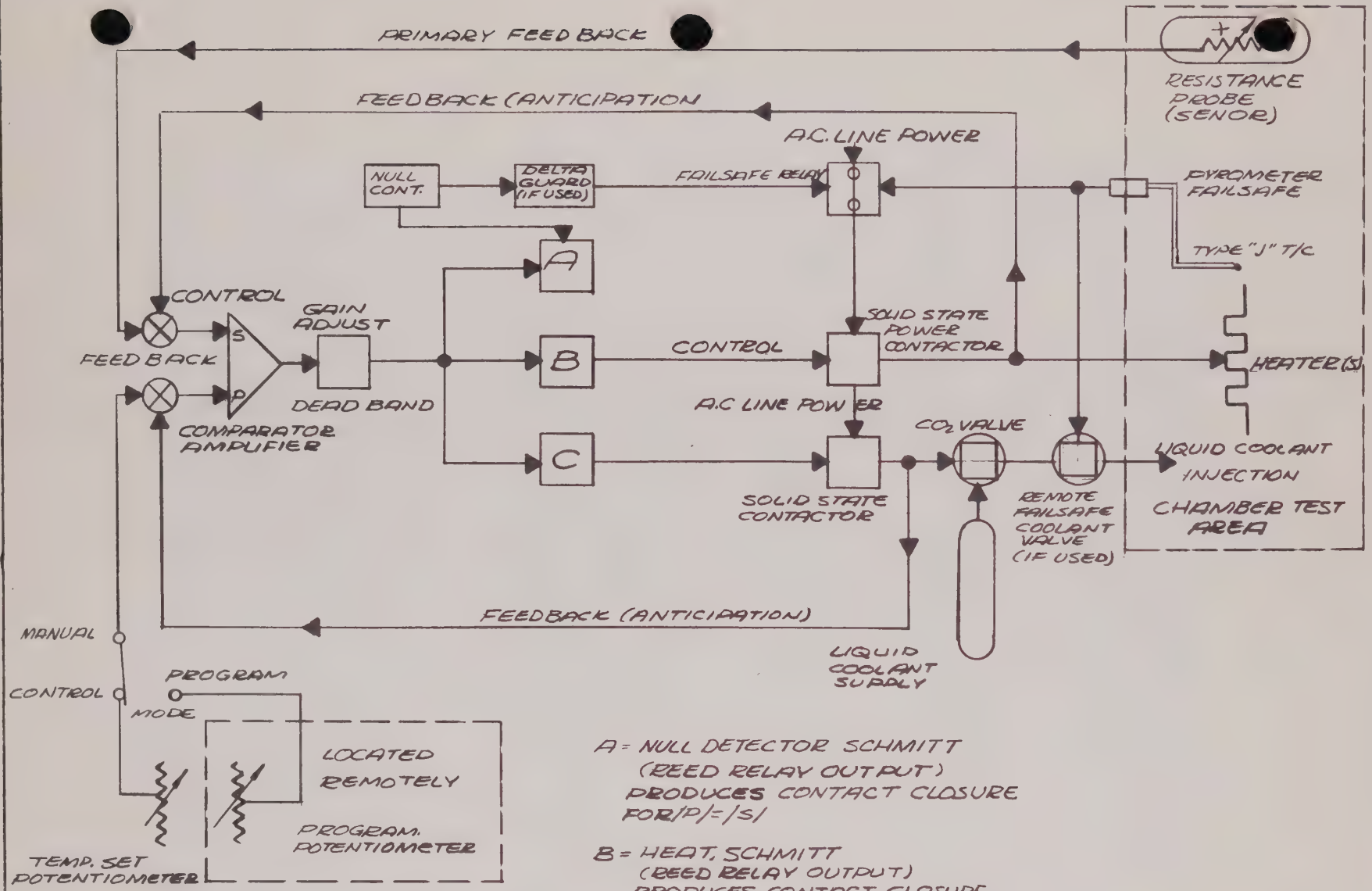


FIG 8B PAGE 12



MK6300H CHAMBER AIR FLOW PATTERN (VERTICAL)

FIG. 9 PAGE 13



A = NULL DETECTOR SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /P/ = /S/

B = HEAT, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /P/ INPUT AT AMPLIFIER
GREATER THAN /S/

C = COOL, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /S/ GREATER THAN /P/

TEMPERATURE CONTROL SYSTEM
SOLID STATE, TYPE III
DELTA DESIGN INC.
LA MESA, CALIF.

INSTALLATION

Rack mounting models may be used as bench mounted types if a 1/2 inch clearance is maintained underneath to allow the required air flow out the bottom of the chamber. This is necessary for proper controller cooling. The mounting feet on bench models maintain the required clearance. Do not operate the chamber without the required air space beneath it.

POWER CONNECTION

The circuit to which the chamb er is to be connected should have a 30 ampere minimum rating. The outlet should be of the polarized type with a grounding lug. Insure that all switches are OFF and plug the chamber power cord into the outlet. THE CHAMBER MUST BE PROPERLY GROUNDED.

240V OPERATION

Delta chambers that operate on 240V AC employ a center-tapped auto transformer to obtain 120V for the coolant valve solenoid, failsafe relays, blowers and for the controller. The heater circuit operates on 240V AC.

REMOTE FAILSAFE COOLANT VALVE

For additional LOW temperature failsafe protection in case the coolant valve sticks or "freezes" OPEN, terminals are provided on the rear of the chamber for connection to an external coolant valve. The remote valve is installed in the coolant line between the supply and the chamber. The valve is electrically energized (VALVE OPEN) when the chamber is in normal operation and is de-energized when the low temperature failsafe is tripped. A Delta Guard can operate a remote failsafe coolant valve if desired. (See Page 21).

LIQUID COOLANT

Liquid Carbon Dioxide - 900 psi system.

Test the bottle by releasing a small amount of LCO_2 into a white handkerchief. Any brown stain indicates rust which would clog the filter. and valve in the chamber. A wet handkerchief indicates water which would either freeze in the valve or clog the injector nozzle. Crack the LCO_2 valve open on the cykinder and notice the spray. It should be a dense, white cloud. It looks thin and gray when the tank is almost empty. An almost empty tank will not give proper cooling and should not be used. Connect the tank of LCO_2 to the rear of the chamber with the supplied high-pressure hose and fittings. Place a small amount of sealing compound on the threads of the male fitting to prevent leakage.

DO NOT LET ANY SEALING COMPOUND GET INTO THE VALVE INLET ON THE REAR OF THE CHAMBER. Open the bottle and check for leaks which show as frosty spots on the hose or fittings.

Liquid Carbon Dioxide - 300 psi Low Pressure system

When the in-plant use of liquid CO_2 exceeds approximately 1000 to 2000 lb. per month, a bulk liquid storage system can be installed to reduce the cost of coolant. Chambers being operated with this type of system have to be fitted with a different CO_2 valve and injector than used on a 900 psi system. Changing a valve is described in Fig. 13. If new chambers are ordered for use with a bulk storage 300 psi system, the fact should be stated on the order.

NOTE: The bulk storage system should be of the recirculating type if possible. If not, the supply should be located as close as possible to the chamber to minimize gas formation in the supply line. This is particularly important in low volume usuage systems as the insulation and fluid flow are the factors that prevent boiling of CO_2 in the supply line. Gaseous CO_2 is not an effective coolant.

All lines, valves and connecting hoses should be blown out before the chamber is connected. Water is very troublesome and is apparently inherent in some low-pressure refrigerated supplies. If lines are opened to bleed off excessive pressure at shutdown, close them to prevent contamination by condensed moisture. This will help to keep ice from forming in the control valve.

LIQUID NITROGEN

Operation to temperatures as low as -300°F is possible with LN_2 as the coolant. The calibration of the TEMPERATURE SET Dial will be somewhat non-linear at temperatures lower than -250°F. A temperature in the chamber of -300°F will be obtained with a dial setting of approximately -285°F.

CAUTION

Oxygen in the air surrounding the chamber inner liner and in the insulation can be liquified at temperatures at or below -297°F. This creates an oxygen rich atmosphere surrounding the heater area. The chamber tends to be self purging as the nitrogen replaces the usual atmosphere near the heaters. Any mixture of oil and liquid oxygen can be explosive so that extreme care must be used during operation at very low temperatures.

A 300 psi valve and stainless steel, polyurethane foam insulated, injector assembly is used for the liquid nitrogen applications. LCO_2 from a tank will not operate properly in a chamber equipped for LN_2.

Liquid nitrogen is furnished by the supplier in withdrawal containers.

Connect a liquid nitrogen liquid withdrawal container to the LN_2 input of the chamber with an insulated transfer line. A relief valve should be installed in the line with a relief pressure between 60 and 100 psi for a 2700 cu. ft. 50 psi liquid withdrawal container.

A motor DE-ICER switch, located on the chamber front panel is provided on some LN_2 chambers. This switch turns on a heater on the chamber blower to melt any ice forming on the impeller blades during the cooling process. Ice on the impeller causes vibration and noise.

ADJUSTING THE FAILSAFE PYROMETER

The pointer on the right side of the pyrometer may be adjusted to indicate the temperature at which the HIGH failsafe relay will trip. The pointer on the left may be adjusted for the LOW temperature trip point.

When power is interrupted or when the power switch is first turned ON the FAILSAFE lamp will be lighted. Manually depressing the RESET switch will place the power circuits in operating condition.

Delta chambers that operate at 600°F or lower are equipped with a thermostatic type failsafe.

ADJUSTING THE FAIL SAFE

The thermostatic Failsafe is adjusted by rotating the slotted FAILSAFE control. The trip temperature is increased by rotating the control counter-clockwise and is lowered by turning the control clockwise. One full turn changes the trip temperature approximately 90° F.

The two recommended procedures for setting the thermostatic Failsafe are:

(1) Operate the chamber at a known temperature. Read the temperature indication on the thermometer and insure that the Heat switch is in the ON position. Turn the Failsafe adjustment clockwise to lower the setting until the Failsafe Lamp turns on. This establishes the setting of the Failsafe. Estimate the number of turns required of the Failsafe adjustment at 90°F per turn, and rotate the control counter-clockwise to the desired setting.

(2) Operate the chamber at the maximum temperature for the test and adjust the Failsafe control so that the Failsafe is on the verge of tripping.

NOTE: DO NOT ADJUST THE FAILSAFE MORE THAN 1 FULL TURN TOWARDS LOWER TEMPERATURES (CLOCKWISE ROTATION) AFTER THE FAILSAFE LIGHT COMES ON AS THE THERMOSWITCH UNIT CAN BE DAMAGED BY FORCING.

READING THE TEMPERATURE SETTING OF THE DIAL INDICATOR - see Fig. 7.

PROGRAMMING THE MK 6300-H CHAMBER - see Fig. 8

Connect the correct resistances between pins 1 and 3 of the PROGRAM Jack. Set the MODE Switch to PROGRAM and the HEAT AND COOL switches to their ON positions. The controller will apply heat or coolant as needed to obtain the programmed temperature.

A Safety Plug is provided with the chamber and should be kept connected to the PROGRAM input whenever an actual programmer or actual resistance is not connected. The safety plug will prevent the chamber from accidently being programmed to a very high temperature if the MODE switch is placed in the PROGRAM position with an open PROGRAM input.

The safety plug disables the heat and cool circuits of the controller when the MODE Switch is placed in the PROGRAM position.

MK 6300- H CHAMBER AND CONTROLLER DESCRIPTION

CHAMBER

The MK 6300-H is a precision environmental temperature test chamber having a stainless steel interior, aluminum outer case and banroc insulation. The air circulation is closed and provided by 140 CFM blowers. (see Fig. 9) The chamber is heated by applying full wave power to bobbin wound nichrome heating elements via the heat solid state switch.

The chamber is cooled by injecting liquid CO_2 (liquid nitrogen in the LN_2 models) into the air stream through an expansion nozzle. The coolant flow is metered by a solenoid valve, controlled by the "cool" solid state switch.

The temperature control system is shown in block diagram form as Figure 10.

SOLID STATE CONTROLLER

The controller compares the resistance of the temperature probe to the resistance of the TEMPERATURE SET Potentiometer. (The resistance of a remote programing resistor is compared to the probe resistance if the MODE Switch is in the PROGRAM Position.)

The resistance of the probe will always be either less than, equal to, or greater than the resistance of the TEMPERATURE SET Potentiometer (program resistance). These three situations directly correspond to the chamber temperature being lower than, equal to, or higher than desired. The controller applies heat, coolant, or withholds both to obtain and maintain the selected temperature in the chamber.

NOTICE, the controller is a three mode unit, i. e. (a) Heat only
(b) No heat or coolant
(c) Coolant only

This mode of control insures that LCO_2 or LN_2 is not wasted in a continuous cycling of the heaters and coolant valve such as would be the case for a simple two state output controller.

NULL DETECTOR CIRCUIT

A contact closure is provided at the rear when the chamber reaches the indicated SET Point of the controller. This contact closure may be used to signal that the chamber has reached selected temperature.

The Delta Design Model 9307 HI-LO Step Programmer, Model 9311 TEN STEP Programmer, and the Model 9312 HI-LO-AMBIENT Programmer utilize the null contacts to start their timers when they are used with the MK 6300 chamber. This contact closure feature is most useful in automatic test programming applications.

PYROMETER - FAILSAFE

The temperature in the workspace is continously monitored by the Pyrometer. When the temperature in the chamber reaches either the HI or LO "failsafe" set point , power to the heater or coolant circuits is interrupted and the FAILSAFE lamp is lighted. Heater or coolant power can be restored only by manually operating the RESET switch.

SOLID STATE SWITCHES

Full wave solid state switches are provided for the heater and coolant circuits, insuring years of trouble free operation.

DELTA GUARD

INTRODUCTION

Where Delta chambers are required to operate for long periods with minimum supervision, a Delta Guard may be employed to give an alarm and remove power from the chamber if temperature control is lost. This feature can be used to advantage in low temperature tests inasmuch as running out of coolant results in a failure indication. The Delta Guard then signals the need for a new bottle of coolant.

The Delta Guard uses the NULL CONTACTS provided by the type III controller. These contacts close only when the chamber temperature is correct. Any control failure causes a deviation of temperature control which causes the null contacts to open.

A buzzer, in addition to the red FAILURE lamp, is provided. The buzzer may be controlled by the SOUND-SILENCE switch. A remote alarm may be connected to a Cinch Jones plug on the rear.

The chamber power cord is plugged into an outlet on the rear of the Delta Guard. In case of failure, power is removed from the chamber.

COOLANT AUTOMATIC TURN OFF PROTECTION (INDEPENDENT OF PYROMETER FAILSAFE CIRCUIT)

Automatic turn off of coolant is obtained by inserting a second or "safety" valve in series with the supply line of coolant. Power for the safety valve solenoid is derived by connecting a junction box into the "Load Receptacle" J1 on the rear of the Delta Guard and connecting both the chamber power cord and the safety valve solenoid coil to the junction box.

The Delta Guard removes power from the chamber and shuts off the supply of liquid coolant in this application.

EXTERNAL RESET

The Delta Guard can be remotely reset by momentarily making a connection

between terminals 5 and 6 (labeled REMOTE RESET). An isolated circuit must be used to perform this function as there is voltage on these terminals with respect to the Chassis.

EXTERNAL FAILSAFE (Automatic Chamber Shut-off)

An external failsafe or turn off device (timer actuated switch) can be connected to the Delta Guard by removing the jumper connecting pin 3 and 4 of the terminal board of the Delta Guard. Connect a set of normally closed isolated contacts between terminals 3 and 4. A momentary interruption of the circuit results in tripping the Delta Guard to FAILURE and consequently complete system shut off.

THEORY OF OPERATION

The Delta Guard is basically a power relay switching system with a relay coil connected through its own holding contacts. The null contacts of the Type III controller cause the power relay "drop out" if they open. These controller "null contacts" close only if the controller is at set temperature and operating properly.

A "Standby" logic circuit is included in the Delta Guard to allow the chamber to initially heat up or cool down. This is necessary because during the heating up or cooling down of the chamber, the controller is not at null and the null contacts are open. The null contacts close and the "standby circuit" de-energizes when the chamber reaches the temperature set on the controller. The Delta Guard automatically switches to NORMAL mode of operation when the null contacts close. An opening of the null contacts after the Delta Guard has switched to NORMAL mode of operation is an indication of control failure and results in system shut down.

ROUTINE MAINTENANCE

Oil main blower motors with Dumore 50-010 Spindle Oil every six months. Oil every month if the chamber is operated coninuously. Place 6 drops of oil in each of the oiler tubes on the motors.

CONTROLLER CALIBRATION PROCEDURE

A periodic calibration of the controller is normally not required.

The required equipment to calibrate the controller will be an oscilliscope and a precision resistor substitution box such as a General Radio Co. type 1432-T.

PREPARATION

(a) Remove the controller module from the chamber or remove the side of the chamber to expose the controller.

(b) Remove the probe input leads to the controller. These are terminals 1 and 2 of TB 1 on the rear of the controller. These are the two top terminals on the left hand board looking at the rear of the unit from the back. Notice which wire goes to which terminal so that they can be put back as originally connected. Connect the resistance box between these two terminals on the rear of the controller.

(c) Connect an oscilliscope to the point shown on the Printed Circuit Board Assembly drawing which is number 1137-C-3, sht. 2 of 2. Connect the ground of the scope to any portion of the controller frame.

(d) Plug the chamber power cord into a source of power, turn the Heat and Cool Switches OFF and the Power switch ON.

(e) Insure that the MODE Switch is in the MANUAL Position.

(f) Verify that the TEMPERATURE SET DIAL rotates freely and at the counterclockwise stop indicates -100°F (-73°C). (-300°F or -184°C for LN_2 models.)

(g) The location of the SLOPE AND OFFSET potentiometers is shown in Fig. 11. Adjust the SLOPE (100 ohm) and the OFFSET (20 ohm) trimpots to the center of their range (10 turns from either end).

CALIBRATION

(a) Rotate the TEMPERATURE SET DIAL to 600°F and select 427.24 ohms on the resistance box. Adjust the SLOPE trimpot until a null occurs on the scope.

(b) Rotate the TEMPERATURE SET DIAL to 100°F and set the resistance box to 209.00 ohms. Adjust the OFFSET trimpot until a null occurs on the scope.

Note: The LOWER temperature adjustment is made on the LOWER RESISTANCE (20 ohms) and the HIGHEST temperature adjustment is made on the HIGHEST RESISTANCE (100 ohm) trimpot. Alternately adjust the 600 and 100 points until the dial is correct at both temperatures.

Turn off and disconnect power, remove the test equipment and re-connect the probe wires to the rear of the controller.

TROUBLE SHOOTING See Fig. 12

The following factors aid the trouble shooting procedures greatly. (1) The red Heat lamp is connected across the controller heat output. A brightly glowing RED lamp is an indication that the heaters are being energized. (2) The green Cool lamp is connected directly across the coolant valve solenoid and when glowing brightly, indicates power applied the solenoid. (3) Turning the MODE Switch to PROGRAM, with the safety plug connected, should extinguish both the Heat and Cool lamps.

The waveforms and DC voltages are shown on the Printed Circuit Assembly Schematic, Drawing Number 1137D-3, sht. 1 of 2 and should be checked for difficult cases.

SOLENOID VALVE REPLACEMENT See Fig. 13

HEATER ASSEMBLY REPLACEMENT See Fig. 14

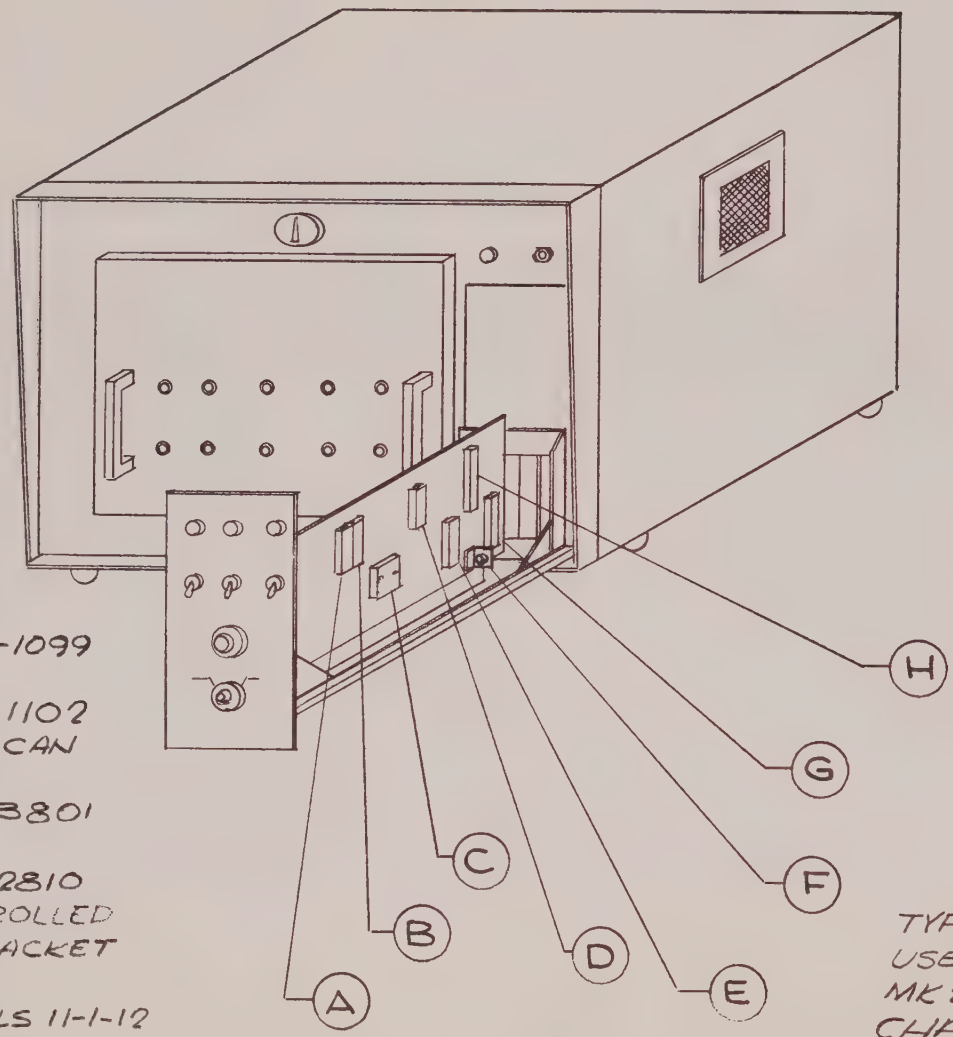
BLOWER MOTOR REPLACEMENT See Fig. 14

TEMPERATURE PROBE REPLACEMENT See Fig. 13

ORDERING REPLACEMENT PARTS

Rlease include the chamber model number, serial number and the part number as listed in the parts list.

A Complete parts list is included as part of this manual.



A. TEMP. OFFSET
200P-1-200, A-1099
B. SLOPE ADJ.
200P-1-101, A-1102
C. ANTICIPATOR CAN
D. GAIN POT.
275-1-501 C-3801
E. REED RELAY
NLS 11-1-12, C-2810
F. SILICON CONTROLLED
RECTIFIER & BRACKET
C-22B, A1104
G. REED RELAY, NLS 11-1-12
H. REED RELAY, NLS 11-1-12

TYPE III CONTROLLER
USED IN MK 6300 &
MK 2300 SERIES
CHAMBER

FIG. 11

1. TURN MODE SWITCH TO MANUAL.
2. NOTE THERMOMETER READING (CHAMBER TEMPERATURE)

TROUBLE SH
HOW TO US

3. TURN HEAT & COOL SWITCHES ON.
4. TURN TEMPERATURE SET CONTROL 50° HIGHER THAN CH COOL LAMPS.
5. TURN TEMPERATURE SET CONTROL 50° LOWER THAN HEAT & COOL LAMPS.
6. ENTER THE CHART AT THE TOP FOR THE CONDI TEMPERATURE.

1. ENTER THE CHART AT THE LEFT SIDE FOR THE CONDITIONS OBSERVE THESE TWO SITUATIONS DETERMINE THE CORRECT BLOCK TO READ IN THE CHART.

LIGHT STATE WITH TEM DIAL 50° HIGHER THAN CH

LIGHT STATE WITH TEMPERATURE SET DIAL 50° LOWER THAN CHAMBER TEMP.	RED - OFF GREEN - OFF	RED - ON GREEN - OFF
RED - OFF GREEN - OFF	PROBE ELEMENT SHORTED TO CASE. (REPLACE) FAILURE ON AMPLIFIER P.C. BOARD. (TRACE SIGNAL WITH SCOPE) GAIN POT. SETTING TOO LOW. XFORMER WINDING OPEN FUSE ON CONT. CHASSIS BLOWN	COOL CIRCUIT HAS TRACE SIGNALS SCOPE.
RED - ON GREEN - OFF		PROBE SHORTED O TEMP. SET POT. - OP COOL ANTICIPATOR OPEN. CHECK BETW TERMINAL A & CASE FOR ≃ 12.Ω
RED - OFF GREEN - ON	FAILSAFE RELAY K1 NOT ENERGIZING. COIL RESISTANCE WILL BE APPROX. 10K. DIODE BRIDGE FAILURE. CHECK CR19 - CR22 ON P.C. BOARD	NORMAL
RED - ON GREEN - ON		HEAT CIRCUIT HA TRACE SIGNAL W SCOPE.

OOTING CHART

E THIS CHART

AMBER TEMP. & NOTE THE CONDITIONS OF THE HEAT &

CHAMBER TEMP. & NOTE THE CONDITIONS OF THE

TIONS OBSERVED IN STEP 4. (50° HIGHER THAN CHAMBER

D IN STEP 5. (50° LOWER THAN CHAMBER TEMPERATURE.)

PERATURE SET

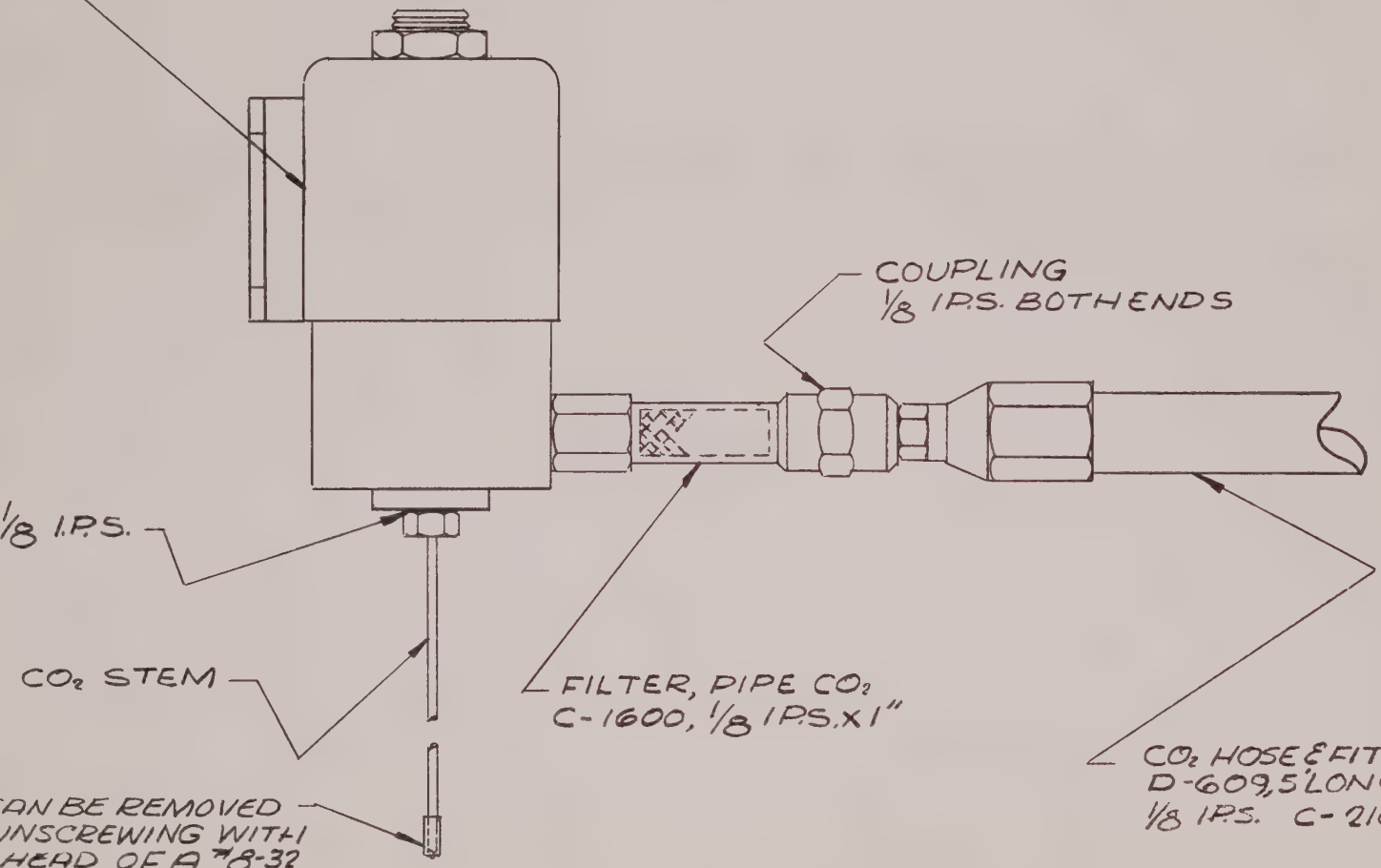
AMBER TEMP.

	RED - OFF GREEN - ON	RED - ON GREEN - ON
FAILED. WITH		
UT. EN WINDING EEN OF Q8		
	PROBE OPEN TEMP. SET POT. SHORTED HEAT ANTICIPATOR WINDING OPEN: CHECK BETWEEN B & CASE OF Q9 FOR = 12Ω	COOL CIRCUIT HAS FAILED - TRACE SIGNAL WITH SCOPE.
S FAILED - TH		

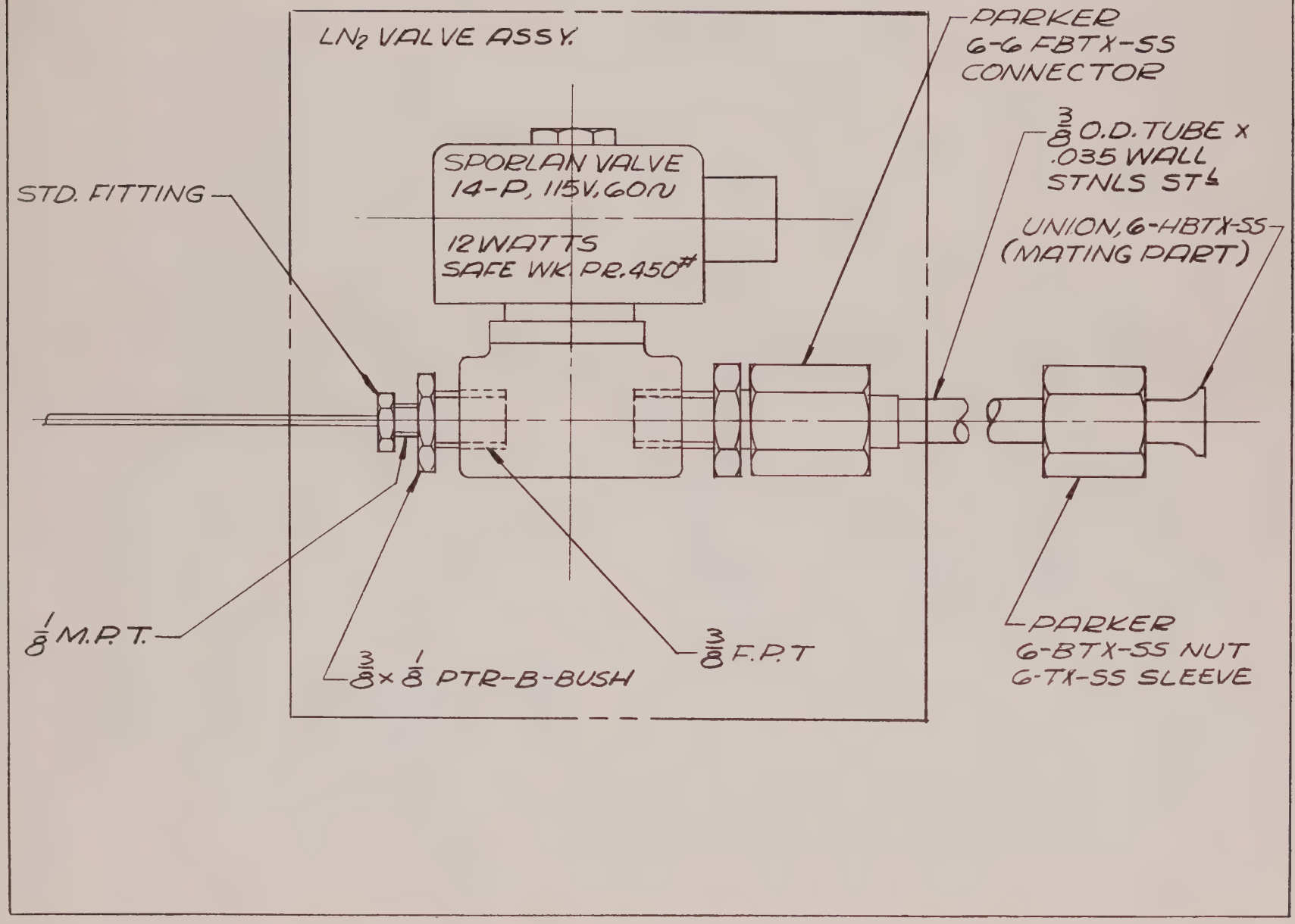
FIG. 12

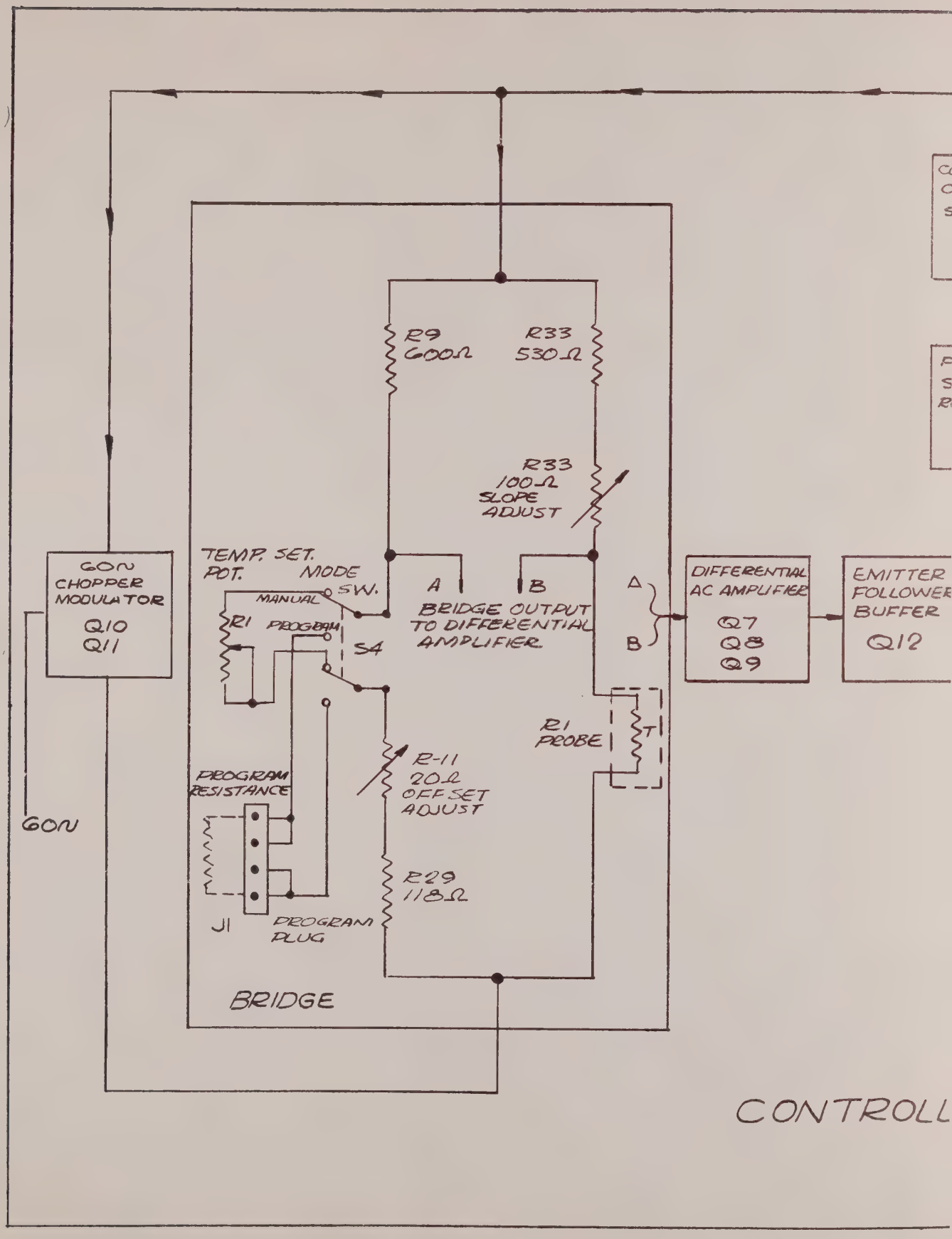
CO_2 VALVE 300 P.S.I. 120V, 60 N
K27PW312BK - DELTA# C-3503
C-2205

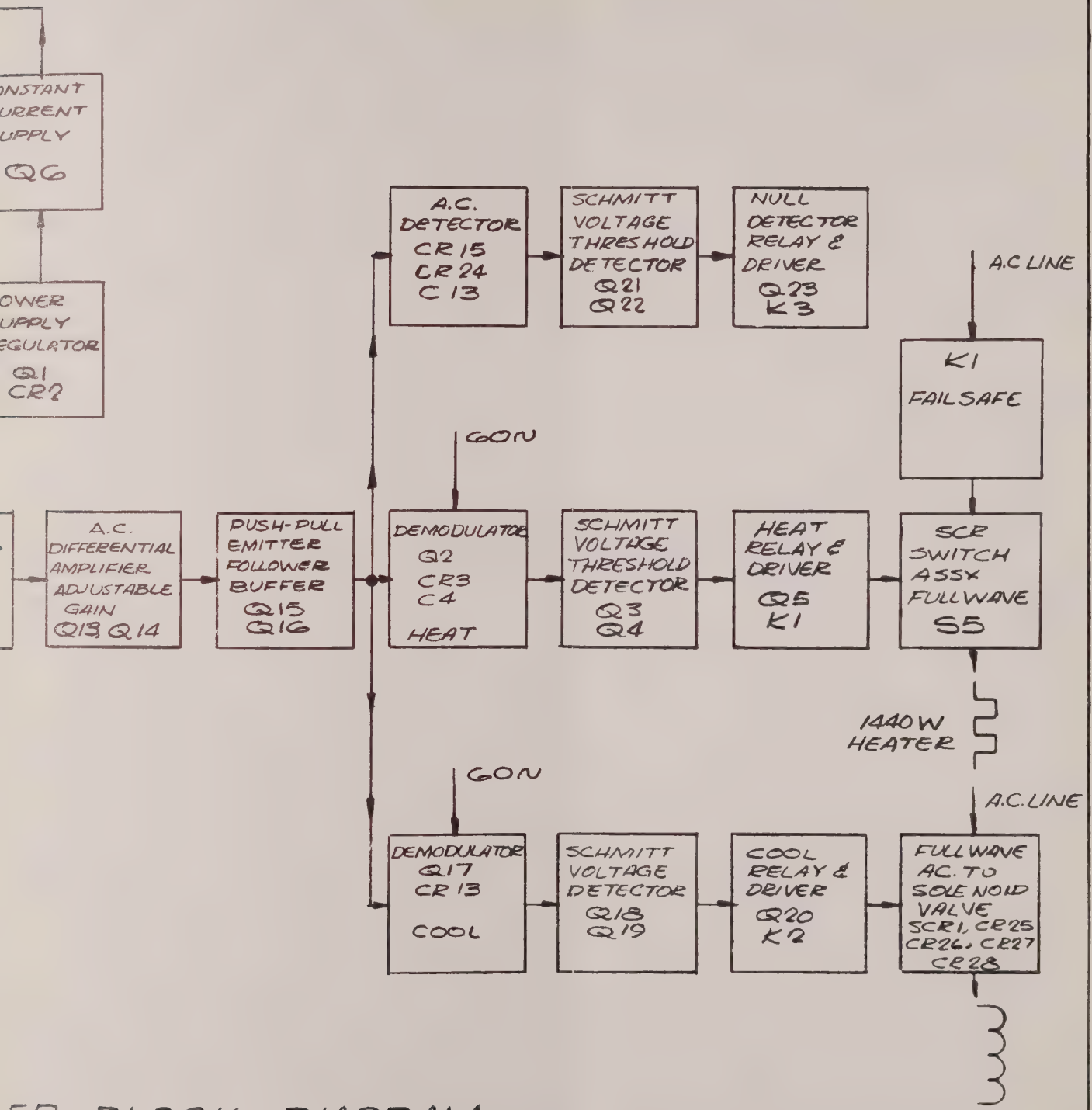
CO_2 VALVE, 900 P.S.I. 120V, 60 N
K27PA112BK - DELTA# C-3502
C-2201



CO_2 VALVE ASSY.


LN2 VALVE ASSY.
SPORLAN VALVE
14-P, 115V, 60N
12 WATTS
SAFE WK PR. 450#
STD. FITTING
1/8 M.P.T.
3/8 x 1/8 PTR-B-BUSH
3/8 F.P.T
PARKER
6-6 FBTX-SS
CONNECTOR
3/8 O.D. TUBE x
.035 WALL
STNLS ST'L
UNION, 6-HBTX-SS
(MATING PART)
PARKER
6-BTX-SS NUT
6-TX-SS SLEEVE

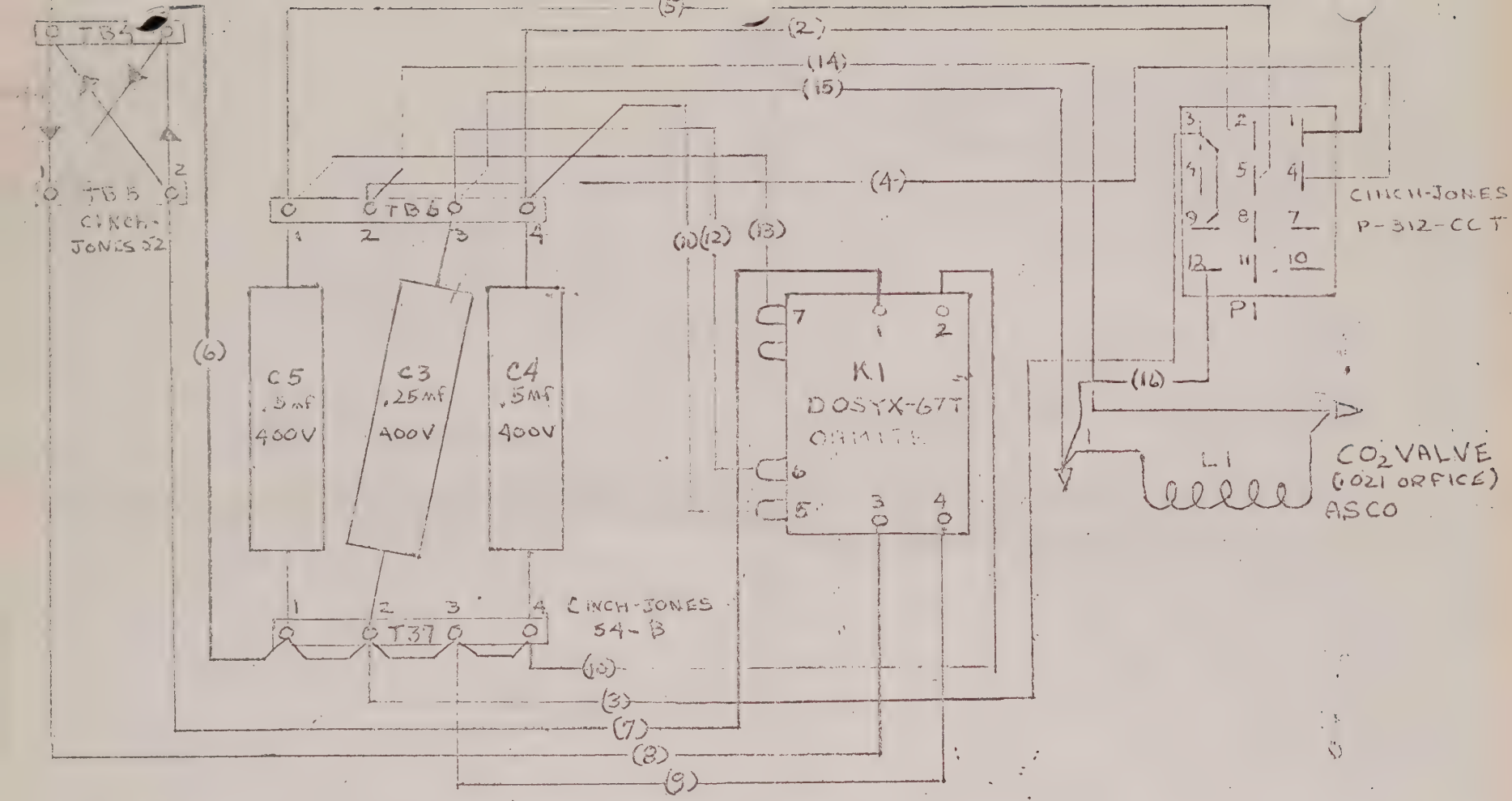

R9
600Ω
R33
530Ω
R33
100Ω
SLOPE
ADJUST
GON
CHOPPER
MODULATOR
Q10
Q11
TEMP. SET.
POT.
MODE
SW.
MANUAL
PROGRAM
R1
S4
A
B
BRIDGE OUTPUT
TO DIFFERENTIAL
AMPLIFIER
A
B
DIFFERENTIAL
AC AMPLIFIER
Q7
Q8
Q9
EMITTER
FOLLOWER
BUFFER
Q12
R1
PROBE
T
R-11
20Ω
OFF SET
ADJUST
PROGRAM
RESISTANCE
GON
R29
118Ω
J1
PROGRAM
PLUG
BRIDGE
CONTROLL



ER BLOCK DIAGRAM

NOV. 30, 1964
KEH

FIG. 16

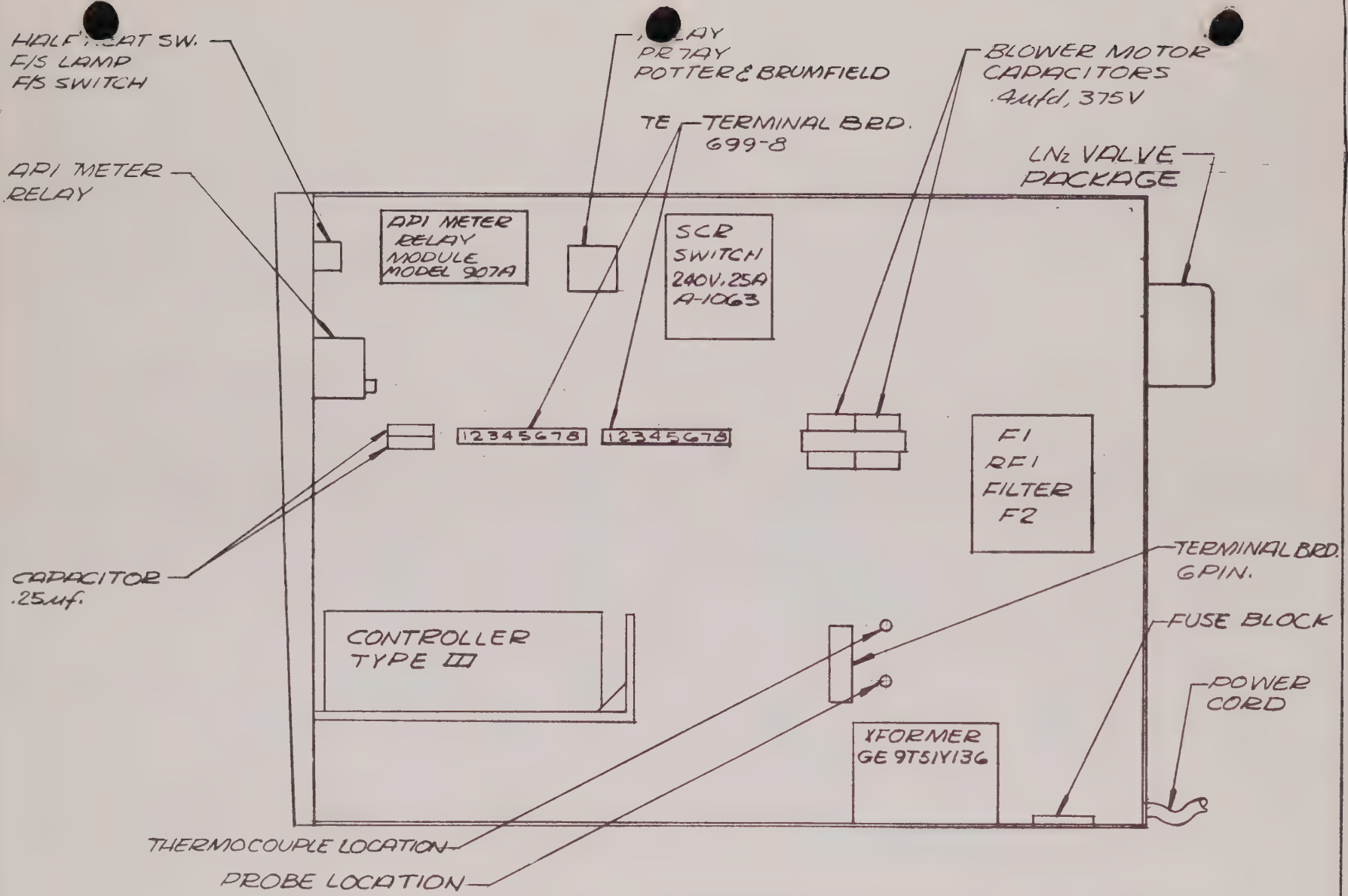


LEGEND

WIRING DIAGRAM
RELAY BRACKET

MODEL 6545A

SERIAL NOS. 3611
3631, 3643



COMPONENT IDENTITY FOR THE MK 6300H

(TO REMOVE HEATER ASSY.)

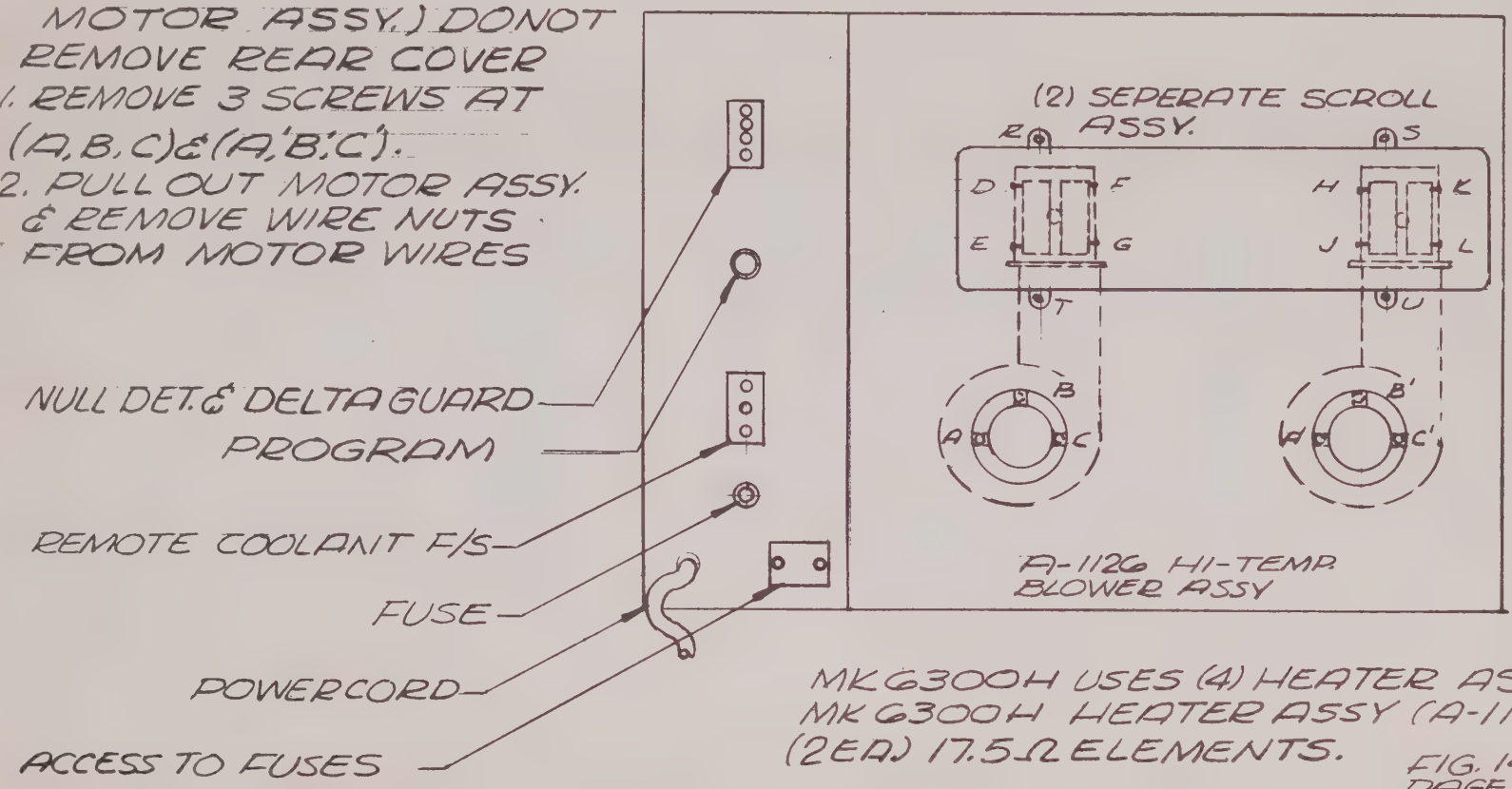
1. UNPLUG POWER CORD.
2. REMOVE SCREWS & TAKE OFF REAR COVER OF CHAMBER.
3. TAG & DISCONNECT FROM TERMINAL BOARD ALL WIRES PASSING THRU GROMMET INTO HEATER & BLOWER COMPARTMENT.
4. CAREFULLY STRAIGHTEN WIRES & UNPACK BANROC INSULATION.
5. REMOVE SCREWS (D,E), (F,G), (H,J), (K,L), & PULL OUT HEATER ASSY.

(TO REMOVE LN_2 VALVE PACKAGE)

UNPLUG CHAMBER POWER CORD.
REMOVE SCREWS R,S,T,U
PULL LN_2 PACKAGE STRAIGHT OUT TO AVOID DAMAGE TO LN_2 INJECTOR ASSY.
REMOVE WIRE NUTS

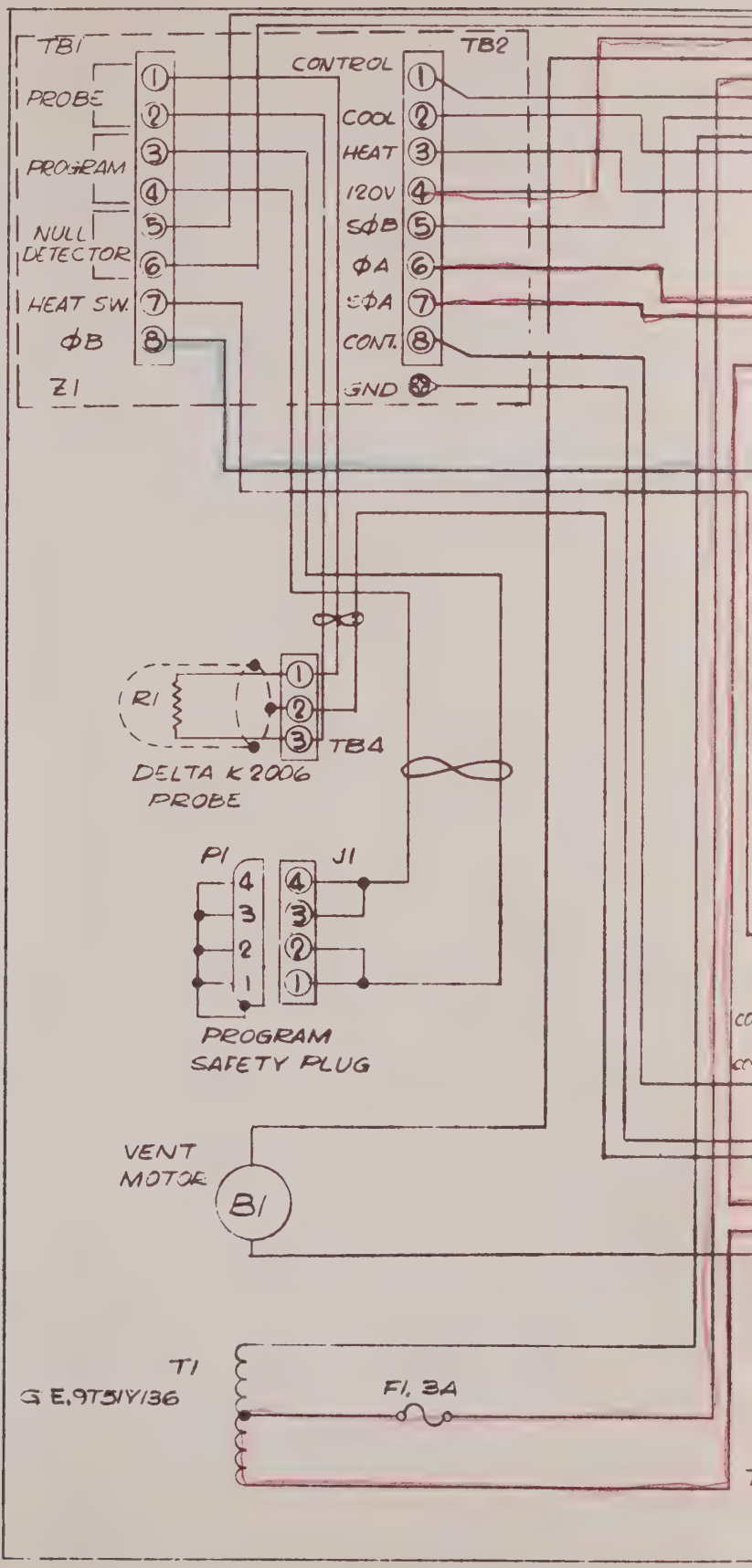
(TO REMOVE BLOWER MOTOR ASSY.) DONOT REMOVE REAR COVER

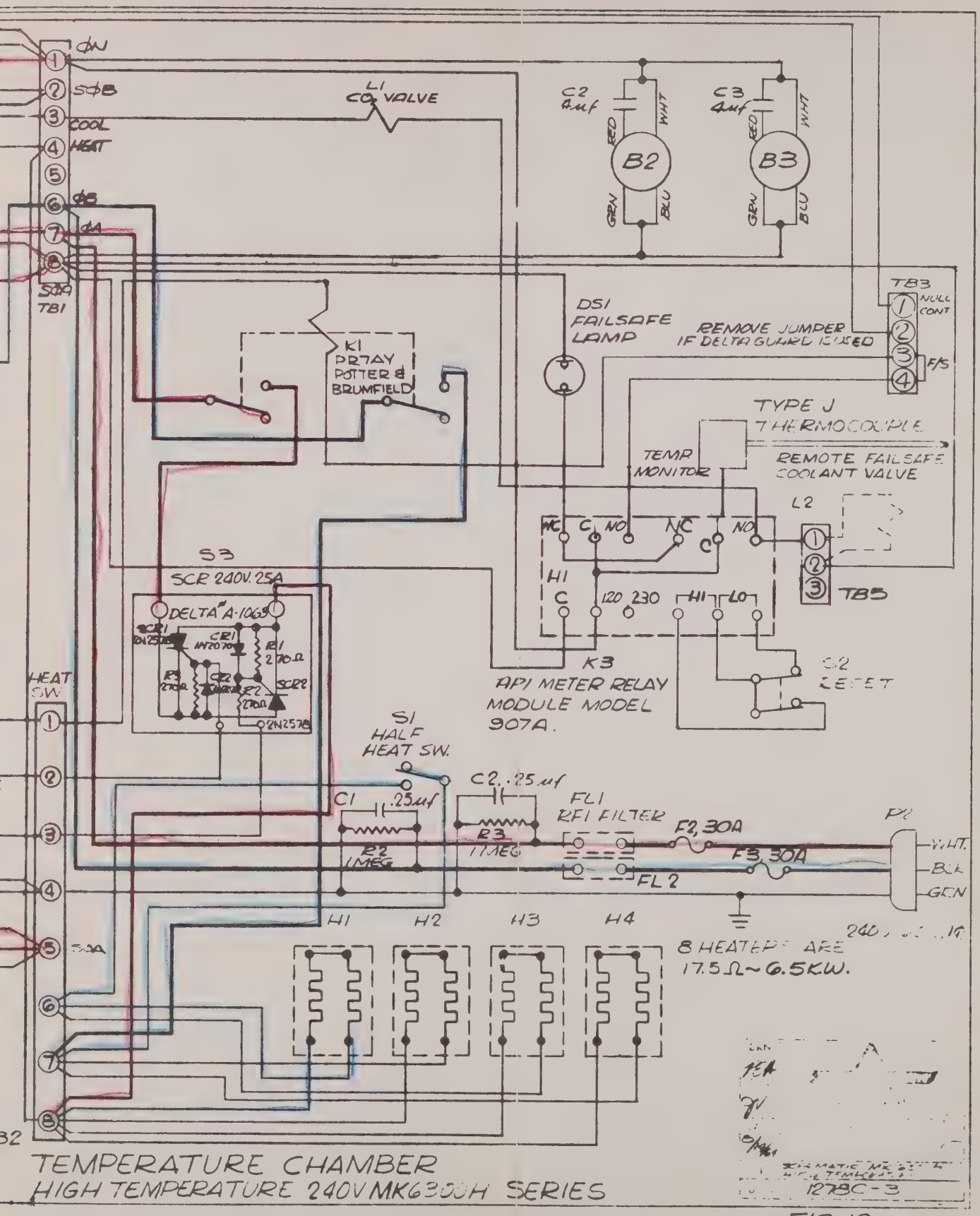
1. REMOVE 3 SCREWS AT (A,B,C) & (A',B',C').
2. PULL OUT MOTOR ASSY. & REMOVE WIRE NUTS FROM MOTOR WIRES



MK6300H USES (4) HEATER ASSY.
MK6300H HEATER ASSY (A-1144)
(2EA) 17.5Ω ELEMENTS.

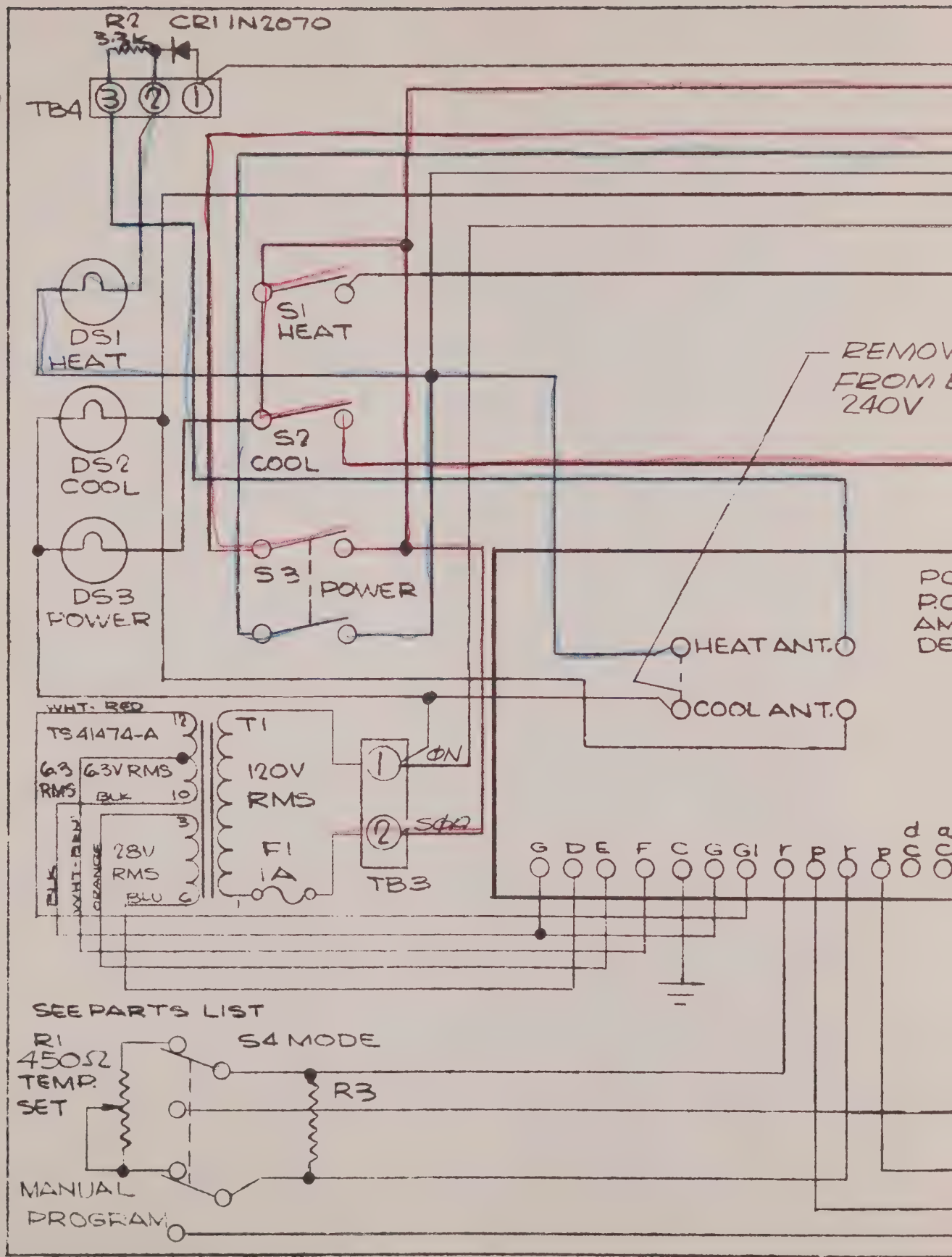
FIG. 14
PAGE 28


TB1
PROBE
PROGRAM
NULL DETECTOR
HEAT SW.
ΦB
Z1
TB2
CONTROL
COOL
HEAT
120V
SΦB
ΦA
SΦA
CONT.
GND
R1
TB4
DELTA K 2006 PROBE
P1
J1
PROGRAM SAFETY PLUG
VENT MOTOR
B1
T1
G E. 9T51Y136
F1, 3A



TEMPERATURE CHAMBER
HIGH TEMPERATURE 240V MK6300H SERIES

1278C-3


R2
3.3K
CR1 IN2070
TB4
3
2
1
DS1
HEAT
S1
HEAT
DS2
COOL
S2
COOL
DS3
POWER
S3
POWER
REMOV
FROM
240V
HEAT ANT.
COOL ANT.
WHT-RED
TS41474-A
12
6.3
RMS
6.3V RMS
BLK
10
28V
RMS
3
BLU
6
BLK
WHT-BRN
ORANGE
T1
120V
RMS
F1
1A
1
ON
2
TB3
G
D
E
F
C
G
G1
r
P
r
P
d
a
SEE PARTS LIST
R1
4505Ω
TEMP.
SET
S4 MODE
R3
MANUAL
PROGRAM

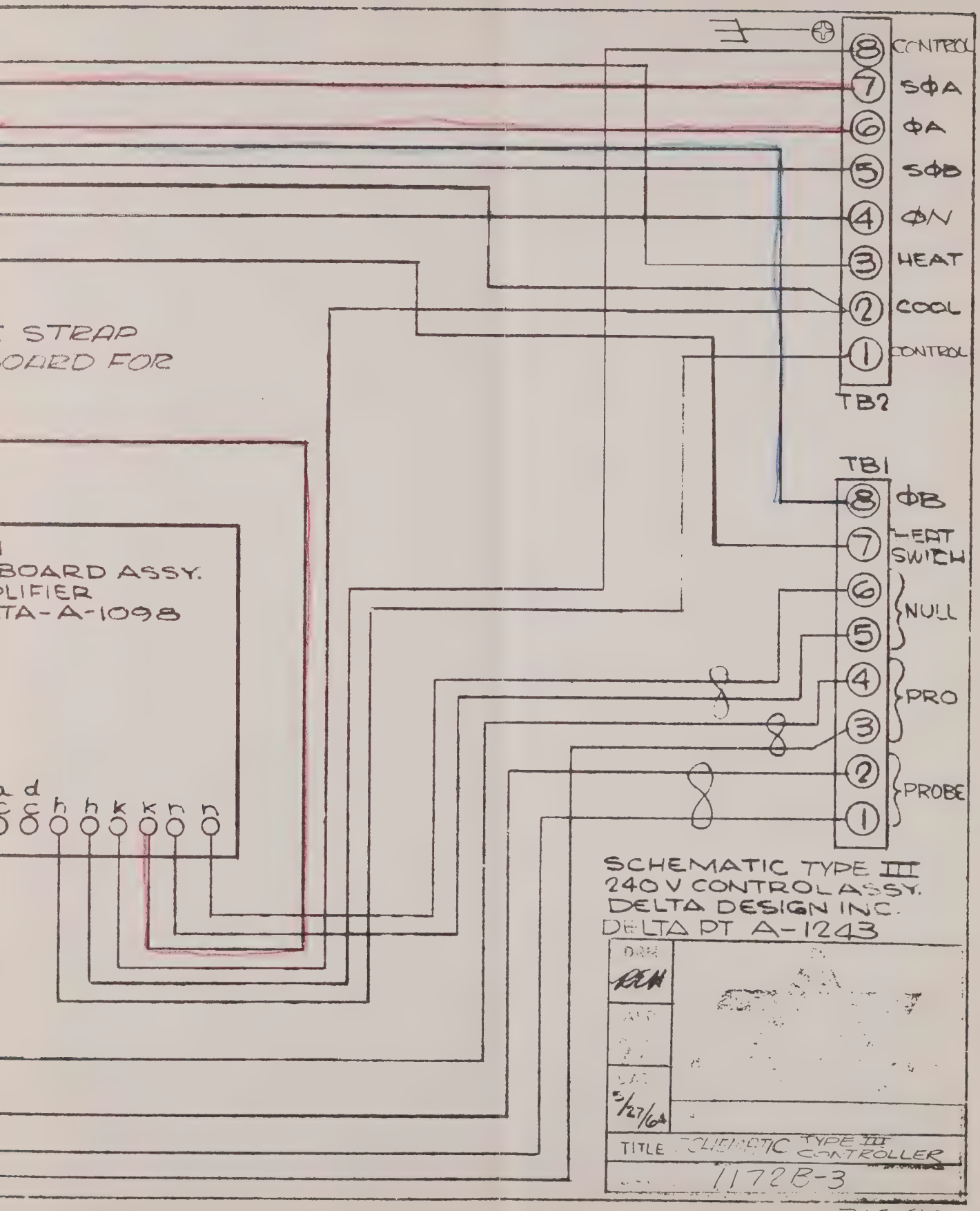
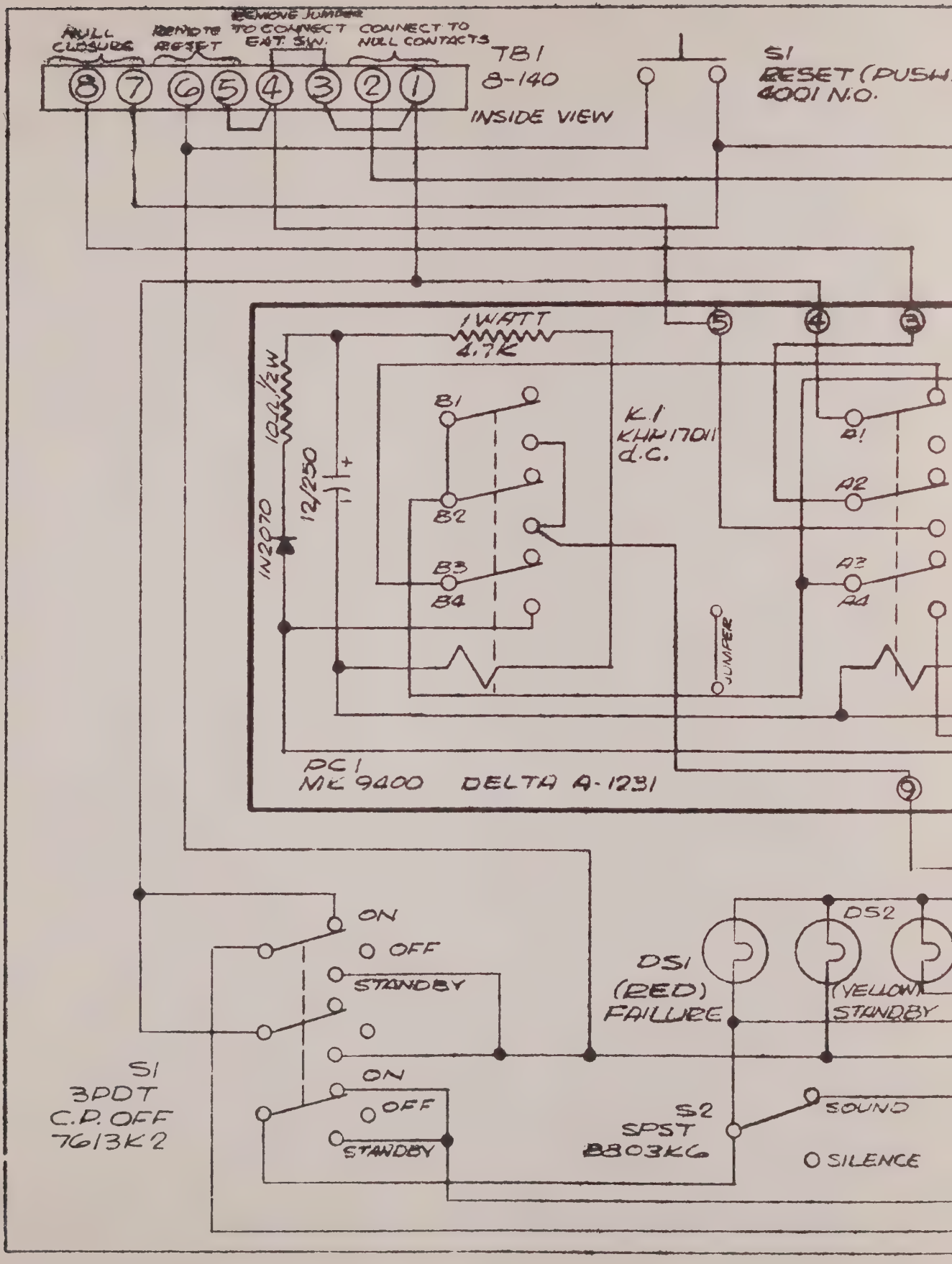


FIG. 20
PAGE 34


NULL CLOSURE
REMOTE RESET
REMOVE JUMPER TO CONNECT EXT. SW.
CONNECT TO NULL CONTACTS
TB1
8-140
INSIDE VIEW
S1
RESET (PUSH
4001 N.O.
1 WATT
4.7K
10K 1/2W
12/250
IN2070
K1
KHP17011
d.c.
B1
B2
B3
B4
A1
A2
A3
A4
JUMPER
PC1
ME 9400 DELTA A-1231
ON
OFF
STANDBY
S1
3PDT
C.P. OFF
7613K2
DS1
(RED)
FAILURE
DS2
(YELLOW)
STANDBY
S2
SPST
8803K6
SOUND
SILENCE

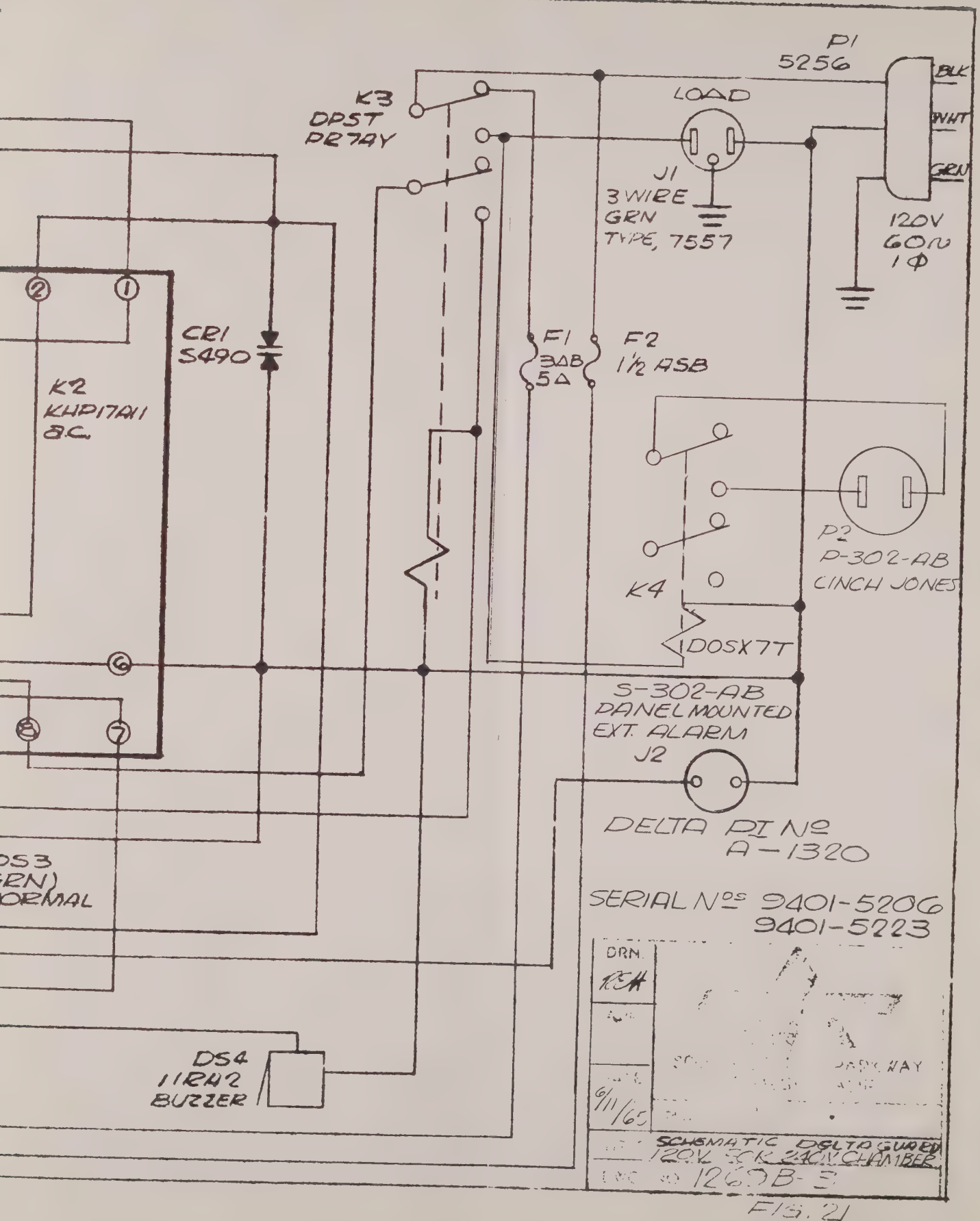
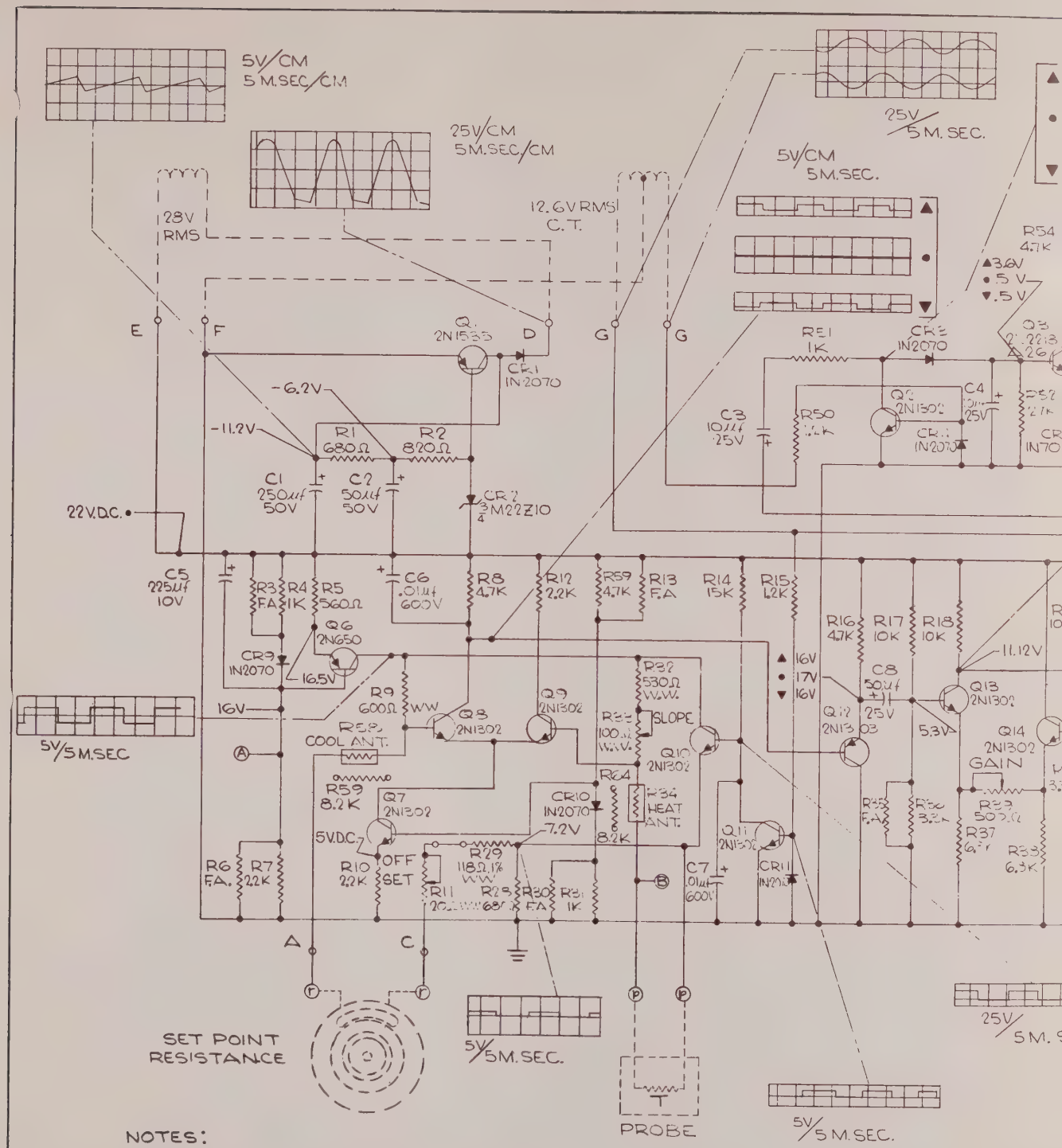


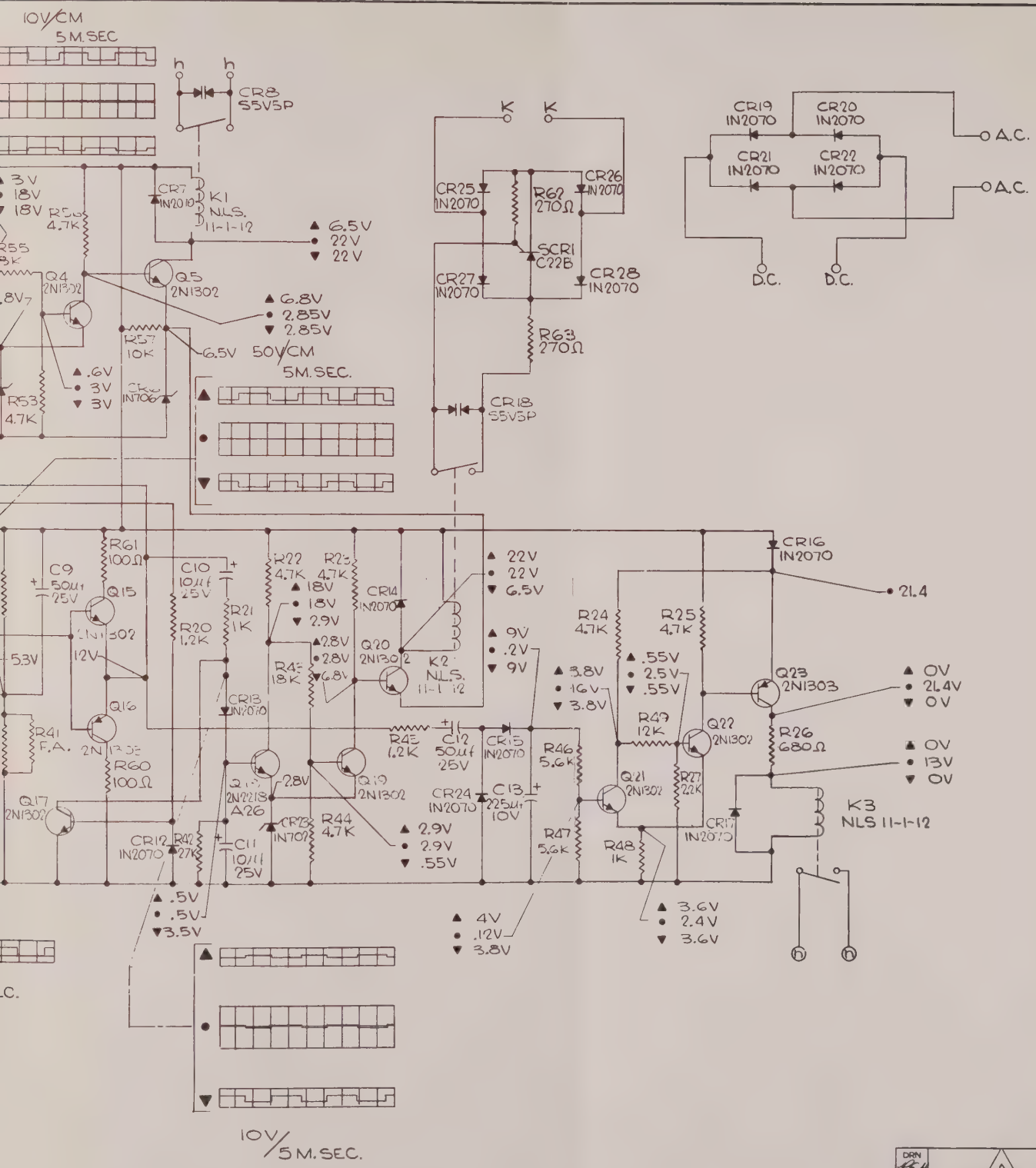
FIG. 21
PAGE 35



NOTES:

1. ALL WAVE FORMS MEASURED WITH TEKTRONIX MODEL 545 OSCILLOSCOPE & TYPE CA PLUG IN UNIT OR EQUIV.
2. Q8 & Q9 ARE A MATCHED PAIR
3. Q13 & Q14 ARE A MATCHED PAIR
4. ▲ SET POINT CONTROL, 10°F HIGHER THAN NULL
5. ● SET POINT CONTROL, SET AT NULL
6. ▼ SET POINT CONTROL, 10°F LOWER THAN NULL
7. ALL VOLTAGES ARE D.C. & MEASURED FROM CHASSIS GROUND WITH 20K Ω/V METER

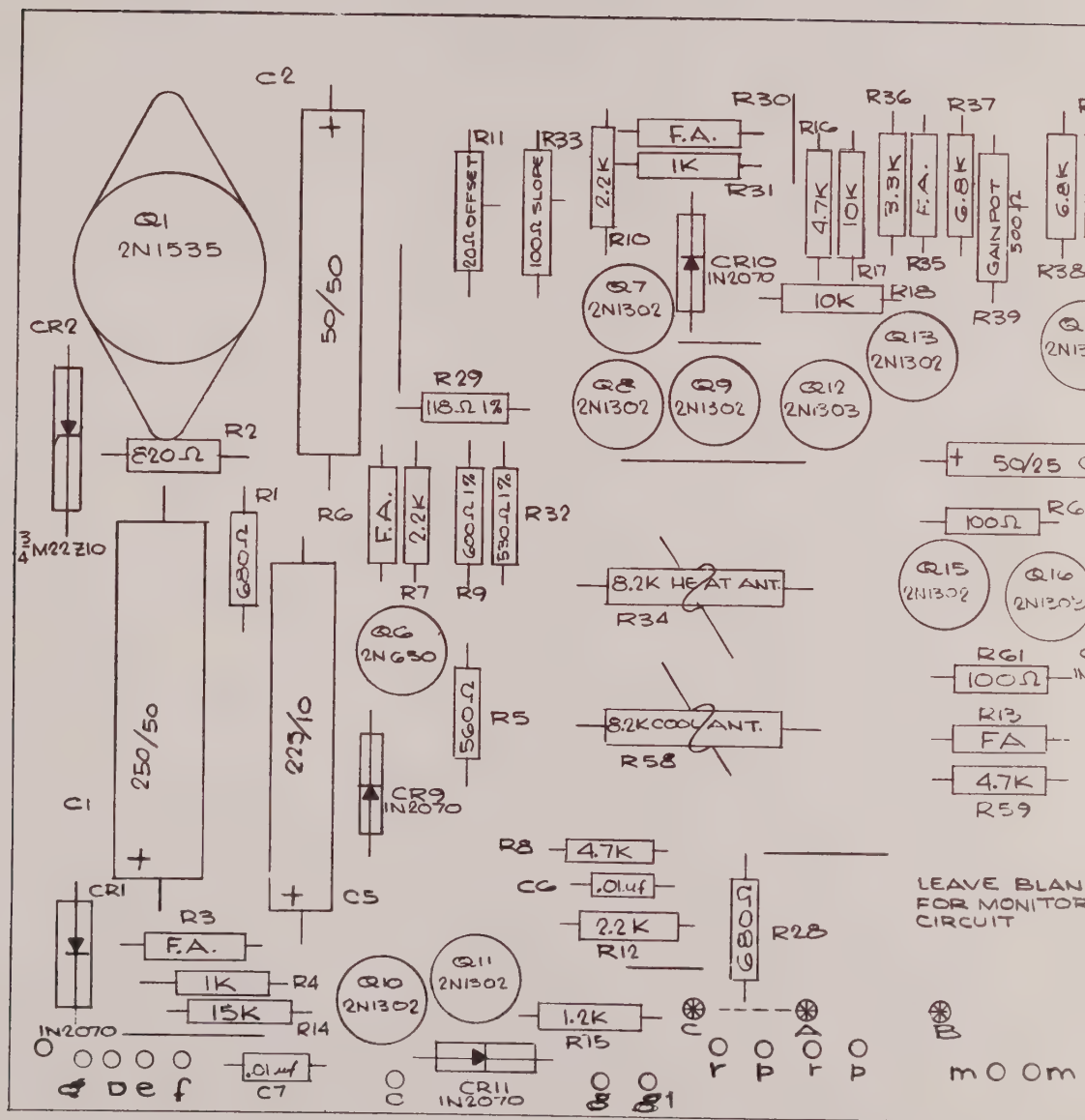
SCHEMATIC TYP
DELTA DESIGN IN



III PRINTED CIRCUIT BOARD ASSY.
PART NO A-1098

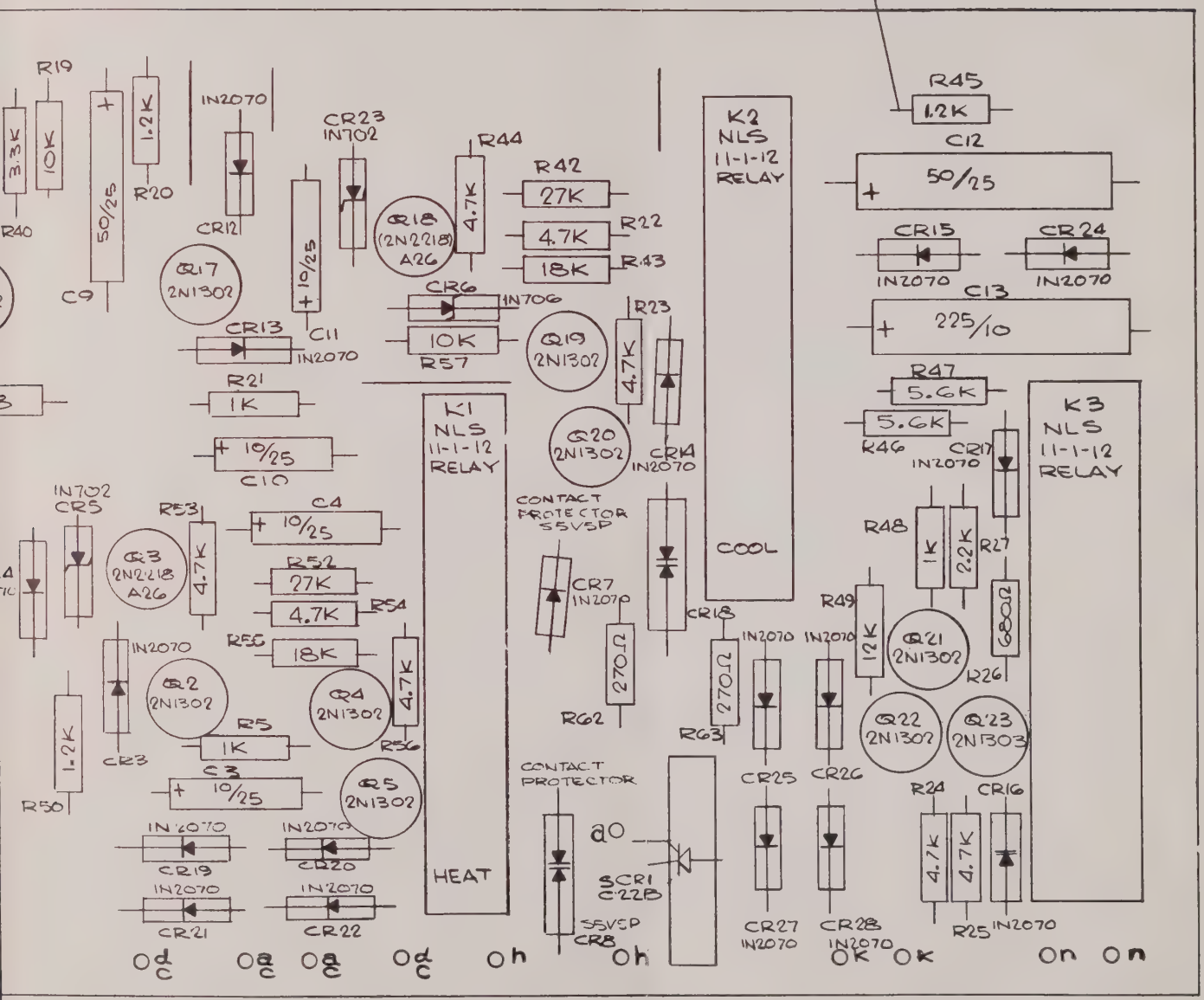
DRN
APR
DATE 4/24/64
DELTA DESIGN
NEXT ASSY
TITLE SCHEMATIC TYPE III PRINTED CIRCUIT BOARD ASSY
DWG NO 11370-3

FIG. 17



GLUE FOUR FIBER WASHERS
ON P.C. BOARD FOR STANDOFFS

PARTS LAYOUT PRI
DELTA DESIGN



TED CIRCUIT BOARD ASSY.
NC. PART NO. A-1089

FIG. 18

PARTS LIST

TITLE TEMPERATURE CHAMBER MK 6300H HIGH TEMPERATURE

DELTA DESIGN, INC. LA MESA, CALIF.

DWG NO. 1171A-4

SHT 1 OF 3

APPD JM DATE 10/13/64

DASH NO.	REF DES.	NO. REQ.	DESCRIPTION	COM'L PT NO	MF'R.	DELTA PT. NO.	
1			SALES OUTLINE				
2			FAB. PARTS LIST				
3			SCHEMATIC				
4			PARTS LIST				
5			WIRING SCHEDULE				N.D.
6			WIRING DIAGRAM				N.D.
7			MECH. & ELEC. ASSY.				N.D.
8	B1	1	BLOWER MOTOR, VENT	WS210F	I.M.C.	A-1032	
9	B2	1	BLOWER MOTOR	140 CFM	DELTA DESIGN	A-1126	
10	B3	1	BLOWER MOTOR	140 CFM	DELTA DESIGN	A-1126	
11	C1	1	CAPACITOR, PAPER	.25MF/400V	CORNELL DUBILIER		
12	C2	1	CAPACITOR, PAPER	.25MF/400V	CORNELL DUBILIER		
13	DS1	1	INDICATOR LAMP ASSY.	380607-2	AMP	A-1112	
14	F1	1	FUSE	3AB3A	LITTLEFUSE	A-1094	
15	F2	1	FUSE	30 AMP, 250V	BUSS	A-1183	
16	F3	1	FUSE	30 AMP, 250V	BUSS	A-1183	
17	H1	1	HEATER, DUAL	17.5 OHMS	DELTA DESIGN	A-1144	
18	H2	1	HEATER , DUAL	17.5 OHMS	DELTA DESIGN	A-1144	
19	H3	1	HEATER , DUAL	17.5 OHMS	DELTA DESIGN	A-1144	
20	H4	1	HEATER , DUAL	17.5 OHMS	DELTA DESIGN	A-1144	
21	FL1	1	FILTER, LINE	33AMP	GENISTRON	A-1184	
22	J1	1	CONNECTOR, PANEL	91-PC4F	AMPHENOL	K-1202	
23	K1	1	RELAY	PR7AY	POTTER AND BRUMFIELD	A-1179	
24	L1	1	VALVE & INJECTOR ASSY.	900PSI	DELTA DESIGN	A-1158	

PARTS LIST

TITLE TEMPERATURE CHAMBER
MK 6300H HIGH TEMPERATURE

DWG NO. 1171A-4
SHT 2 OF 3

DELTA DESIGN, INC. LA MESA, CALIF.

APPD [illegible] DATE 12/13/64

DASH NO.	REF DES.	NO. REQ.	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.	
25		1	VALVE & INJECTOR ASSY.	300 PSI	DELTA DESIGN	A-1159	
26	P2	1	POWER CORD ASSY.	10/3C,,SO 600V	DELTA DESIGN	A-1054	
27	P1	1	SAFETY PLUG		DELTA DESIGN	A-1010	
28	R1	1	PROBE, -300°F TO +1000°F		BURNS	A-1157	
29	R2	1	RESISTOR	1 MEG, ½W, 5%	STACKPOLE		
30	R3	1	RESISTOR	1 MEG, ½W, 5%	STACKPOLE		
31	S1	1	SWITCH, HALF HEAT . S.P.S.T.	7501	CUTLER HAMMER	K-2201	
32	S2	1	SWITCH, RESET DPDT MOM. OFF	7568	CUTLER HAMMER	A-1172	
33	S3	1	SOLID STATE SWITCH	240V, 25A	DELTA DESIGN	A-1063	
34	T1	1	TRANSFORMER	9T51Y136	GENERAL ELECTRIC	A-1174	
[illegible]	TB1	1	TERMINAL BOARD 8POS.	699-8	KULKA	A-1109	
36	TB2	1	TERMINAL BOARD 8POS.	699-8	KULKA	A-1109	
37	TB3	1	TERMINAL BOARD 2 POS.	2-140	CINCH JONES	A-1111	
38	TB4	1	TERMINAL BOARD 3 POS.	3-140	CINCH JONES	A-1110	
39	TB5	1	TERMINAL BOARD 3 POS.	3-140Y	CINCH JONES	A-1057	
40	XF1	1	FUSEHOLDER	342012	LITTLEFUSE	K-1501	
41	XF2	1	FUSEHOLDER 30A, 250V	8421-3	GENERAL ELECTRIC.	A-1181	
42	FL2	1	FILTER, LINE	33A	GENISTRON	A-1184	
43	Z1	1	CONTROLLER °F		DELTA DESIGN	A-1140-2	
			OR				
44		1	CONTROLLER °C		DELTA DESIGN	A-1140-4	
45	TB6	1	TERMINAL STRIP 2 PTS	863	H.H. SMITH	A-1116	
46		1	STRAIN RELIEF	8P-1	HEYCO		
47	K3	1	OPTICAL METER RELAY	TYPE J	API	A-1120	
[illegible]		1	OPTICAL METER RELAY MODULE	907	API	A-1119	
49	L1	1	LN2 INJECTOR ASSY		DELTA DESIGN	A-1370	

PARTS LIST

TITLE TEMPERATURE CHAMBER MK 6300 H HIGH TEMPERATURE

DWG NO. 1171A-4

SHT 3 OF 3

DELTA DESIGN, INC. LA MESA, CALIF.

APPD [signature] DATE 10/13/64

DASH NO.	REF DES.	NO. REQ	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.	
50	TC1	1	THERMOCOUPLE, IRON CONT.	TYPE "J"	DELTA DESIGN	A-1182	
51		1	HOSE ASSY		DELTA DESIGN	C-2100	

PARTS LIST

DWG NO. 1197A-4

SHT 1 OF 2

TITLE DELTA GUARD MK 9400
PARTS LIST

DELTA DESIGN, INC. LA MESA, CALIF.

APPD DATE

DASH NO.	REF DES.	NO. REQ.	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.	
1			SALES OUTLINE				
2			FABRICATION PARTS LIST				
3			SCHEMATIC				
4			PARTS LIST				
5			WIRING SCHEDULE				N/D
6			WIRING DIAGRAM				N/D
7			ELECTRO-MECH. ASSY.				N/D
8	CR1	1	CONTACT PROTECTOR	S 490	SARGENT-TARIZAN	K-2501	
9	DS1	1	INDICATOR LAMP ASSY. (YEL.)		SYLVANIA	A-1016	
10	DS2	1	INDICATOR LAMP ASSY. (GRN.)		SYLVANIA	A-1015	
11	DS3	1	INDICATOR LAMP ASSY. (RED)		SYLVANIA	A-1014	
12	DS4	1	BUZZER ALARM 115 VAC	11RA2		A-1203	
13	F1	1	FUSE 5 AMP	3AB5A	LITTLEFUSE	A-1220	
14	F2	1	FUSE 1 1/2ASB	3AB1 1/2 ASB	LITTLEFUSE		
15	J1	1	CONNECTOR, POWER FEMALE 3 WIRE, GRD TYPE, FLUSH	7557	HUBBELL		
16	J2	1	CONNECTOR, PANEL MOUNTED 2 PIN FEMALE	S-302-AB	CINCH JONES	A-1088	
17	K1	1	RELAY 4P.DT	KHP17D11 (DC)	POTTER BRUMFIELD	A-1239	
18	K2	1	RELAY 4PDT. .T.	KPH17A11 (AC)	POTTER BURMFIELD	A-1238	
19	K3	1	RELAY D.P.D.T.	PR7AY	POTTER BRUMFIELD	A-1179	
20	P1	1	PLUG, POWER 3 PIN	5256	HUBBELL		
21	S1	1	N.O. PUSH BUTTON SWITCH	4001 N.O.	GRAYHILL	A-1219	
22	S2	1	SWITCH 3PDT CENTER POSITION OFF.	7613K2	CUTLER HAMMER	A-1207	
23	S3	1	SWITCH SPST	8803K6	CUTLER HAMMER	K-2201	
24	TB1	1	TERMINAL STRIP 8 PIN	8-140Y	CINCH JONES	A-1221	
25		1	POWER CORD#12-SO 12 GUAGE		DELTA DESIGN	A-1054	

PARTS LIST

DELTA GUARD MK 9400

TITLE PARTS LIST

DWG NO. 1197A-4

SHT 2 OF 2

DELTA DESIGN, INC. LA MESA, CALIF.

APPD DATE

DASH NO.	REF DES.	NO. REQ.	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.	
26		1	MOUNTING NUT	7C-1040	GRAYHILL		
27	XF1	1	FUSEHOLDER	342012	LITTLEFUSE	K-1501	
28	XF2	1	FUSEHOLDER	342-12	LITTLEFUSE	K-1501	
29		4	MOUNTING FEET GRAY RUBBER		ALANTIC INDIA RUBBER	A-1134	
30		1	GROMMET	8P1	HEYCO		
31		14	#6-32X½. PAN HD. PHILLIPS NICKEL PLATED.				
32		16	#4-40 SWAGE NUTS				
33		6	#6-32X3/8 PAN HD. NICKEL PLATED				
34		8	#6-32 NUT				
35		8	#6 LOCKWASHERS				
36		12	#4-40 X3/8L.OVAL HD. PHIL. NICKEL PLATED				
37		4	#4-40X3/8L FLAT HEAD PHIL. NICKEL PLATED				
38		6	#6 WASHERS PLAIN NICKEL PLAT.				
39		12	#6-32 SWAGE NUTS				

PARTS LIST

DWG NO. 1172A-4

SHT 1 OF 3

TITLE CONTROLLER ASSEMBLY 240 V TYPE 3
DELTA DESIGN INC, A 1172-1 THROUGH -16

DELTA DESIGN, INC. LA MESA, CALIF.

APPD [illegible] DATE 10/15/64

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L PT NO	MF'R.	DELTA PT. NO.	
1			SALES OUTLINE				N/A
2			SHEET METAL PARTS LIST				
3			SCHEMATIC				
4			PARTS LIST				
5			WIRING SCHEDULE				N/A
6			WIRING DIAGRAM				N/A
7			MECH. & ELEC. ASSY.				N/A
8	CR1	1	DIODE, 1 AMP, 400V PIV	1N 2070	SEMICON	A-1031	
9	DS1	1	INDICATOR LAMP ASSY. RED		SYLVANIA	A-1014	
10	DS2	1	INDICATOR LAMP ASSY. GREEN		SYLVANIA	A-1015	
11	DS3	1	INDICATOR LAMP ASSY. WHT.		SYLVANIA	A-1013	
12	F1	1	FUSE 1 AMP.	3AB1A	LITTLEFUSE		
13	PC1	1	PRINTED CIRCUIT ASSY. AMPLIFIER		DELTA DESIGN		
14	R1	1	POTENTIOMETER	SEE ATTACHED PAGE		A-1098	
15	R2	1	RESISTOR, CARBON COMP.	3.3K, ½W, 5%			
16	R3	1	RESISTOR F/A	½W, 5%			
17	S1	1	SWITCH SPST	1730	H.H. SMITH	K-2202	
18	S2	1	SWITCH SPST	1730	H.H. SMITH	K-2201	
19	S3	1	SWITCH SPST	1730	H.H. SMITH	K-2201	
20	S4	1	SWITCH, ROTARY	T207	IRC	K-2202	
21	T1	1	TRANSFORMER	TS41474A	TRANSONICS	K-2300	
22	TB1	1	TERMINAL BOARD	8PLC. KLIPTITE	KULKA	A-1109	
23	TB2	1	TERMINAL BAORD	8PLC. KLIPTITE	KULKA	A-1109	
24	TB3	1	TERMINAL BOARD	2-140	CINCH JONES	A-1084	
25	XF1	1	FUSEHOLDER	356001	LITTLEFUSE	A-1115	

PARTS LIST

DWG NO. 1172-4

SHT 2 OF 3

TITLE CONTROLLER ASSY. 240V TYPE 3
DELTA DESIGN INC. 1172-1 THROUGH -16

DELTA DESIGN, INC. LA MESA, CALIF.

APPD DATE

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L PT NO	MF'R.	DELTA PT. NO.	
26		1	DIAL ASSY,		BORG	K-1300	
27		1	KNOB		ROGAN	K-1301	
28		1	TERMINAL STRIP 2 PIN	1088	H.H.SMITH	A-1116	
29		1	#632 SWAGE NUT		SOUTHCO		
30		1	1/4" STANDOFF		CAMBION		
31		1	#6032X1/2L ROUND HEAD SCREW				
32		1	#6032X½L ROUND HEAD SCREW				
33		1	#6-32X 3/8 FLAT HD. SCREW				
34		1	#4-40X 3/8 ROUND HD. SCREW				

TITLE CONTROLLER ASSEMBLY 240V. TYPE 3 DWG. NO. 1172A-4

DELTA DESIGN INC. A-1172-1 THROUGH -16 SHEET 3 OF 3

DELTA DESIGN INC. LA MESA, CALIF. APPD. DATE.

MODEL #	TEMPERATURE RANGE		POTENTIOMETER	DELTA#	CONFIG.	PANEL
A-1172-1	-100°F	+600°F	7 1/3T. 450 OHMS/10T	A-1024	VERT. °F.	1122A-2-1
A-1172-2	-100°F	+600°F	7 1/3T. 450 OHMS/10T	A-1024	HORIZ.°F.	1122A-2-4
A-1172-3	-73°C	+315°C	4T. 396 OHMD/5T	A-1097	VERT. °C	1122A-2-1
A-1172-4	-73°C	+315°C	4T. 396 OHMS/5T	A-1097	HORIZ.°C	1122A-2-4
A-1172-5	-300°F	+600°F	9 1/3T. 450 OHMS/10T	A-1137	VERT. °F	1122A-2-1
A-1172-6	-300°F	+600°F	9 1/3T. 450 OHMS/10T	A-1137	HORIZ.°F	1122A-2-4
A-1172-7	-100°F	+1000°F	11 1/2T. 567 OHMS/15T	K-1805	VERT. °F	1122A-2-1
A-1172-8	-100°F	+1000°F	11 1/2T. 567 OHMS/15T	K-1805	HORIZ.°F	1122A-2-4
A-1172 9	-300°F	+1000°F	13 1/2T. 567 OHMS/15T	A-1142	VERT. °F	1122A-2-1
A-1172-10	-300°F	+1000°F	13 1/2T. 567 OHMS/15T	A-1142	HORIZ.°F	1122A-2-4
A-1172-11	-184°C	+315°C	5T. 396 OHMS/5T	A-1138	VERT. °C	1122A-2-1
A-1172-12	-184°C	+315°C	5T. 396 OHMS/5T	A-1138	HORIZ. °C	1122A-2-4
A-1172-13	-73°C	+538°C	10T. 675 OHMS/61/4T	A-1139	VERT. °C	1122A-2-1
A-1172-14	-73°C	+538°C	10T. 675 OHMS/61/4T	A-1139	HORIZ. °C	1122A-2-4
A-1172-15	-184°C	+538°C	10T. 675 OHMS/71/3T.	A-1143	VERT. °C	1122A-2-1
A-1172-16	-184°C	+538°C	10T. 675 OHMS/71/3T	A-1143	HORIZ. °C	1122A-2-4

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 1 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Item No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
1			Sales Outline				N/A
2			Sheet Metal Parts List				N/A
3			Schematic				
4			Parts List				
5			Wiring Schedule				N/A
6			Wiring Diagram				N/A
7			Mech. & Elect. Assy.				N/A
8	C1	1	Capacitor Electrolytic	250 M.F. 50V	Cornell Dub'ilier	K-1100	
9	C2	1	Capacitor Electrolytic	50 M.F. 50V	Cornell Dubilier		
10	C3	1	Capacitor Electrolytic	10 M.F. 25V	Cornell Dubilier		
11	C4	1	Capacitor Electrolytic	10 M.F. 25V	Cornell Dubilier		
12	C5	1	Capacitor Electrolytic	225 M.F. 10V	Cornell Dubilier		
13	C6	1	Capacitor Disc.	.01 M.F. 600V	Centralab		
14	C7	1	Capacitor, Disc.	.01 M.F. 600V	Centralab		
15	C8	1	Capacitor Electrolytic	50 M.F. 25V	Cornell Dubilier		
16	C9	1	Capacitor Electrolytic	50 M.F. 25V	Cornell Dubilier		
17	C10	1	Capacitor Electrolytic	10 M.F. 25V	Cornell Dubilier		
18	C11	1	Capacitor Electrolytic	10 M.F. 25V	Cornell Dubilier		
19	C12	1	Capacitor Electrolytic	50 M.F. 25V	Cornell Dubilier		
20	C13	1	Capacitor Electrolytic	225 M.F. 10V	Cornell Dubilier		
21	CR1	1	Diode, 1A 400 V PIV	1N 2070	Semicon	A-1031	
22	CR2	1	Diode, Zener 22V	3/4M22Z10	Motorola		
23	CR3	1	Diode, 1A 400 V PIV	1N 2070	Semicon	A-1031	
24	CR4	1	Diode, 1A 400 V PIV	1N 2070	Semicon	A-1031	
25	CR5	1	Diode, Zener, 2V	1N 702	Dixon		

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 2 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Mfg. Dash No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
26	CR6	1	Diode, Zener 6V	1N 706	Dixon		
27	CR7	1	Diode, IA 400V PIV	1N 2070	Semicon	A-1031	
28	CR8	1	Contact Protector	S5V5P	I.R.C.	K-2500	
29	CR9	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
30	CR10	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
31	CR11	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
32	CR12	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
33	CR13	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
34	CR14	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
35	CR15	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
36	CR16	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
37	CR17	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
38	CR18	1	Contact Protector	S5V5P	I.R.C.	K-2500	
39	CR19	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
40	CR20	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
41	CR21	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
42	CR22	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
43	CR23	1	Diode, Zener 2V	1N 702	Dixon		
44	CR24	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
45	CR25	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
46	CR26	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
47	CR27	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
48	CR28	1	Diode, 1A 400V PIV	1N 2070	Semicon	A-1031	
49	K1	1	Relay, Reed	NLS 11-1-12	Non-Linear	C-2810	
50	K2	1	Relay, Reed	NLS 11-1-12	Non-Linear	C-2810	

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 3 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Mach. No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
51	K3	1	Relay, Reed	NLS 11-1-12	Non-Linear	C-2810	
52	PC1	1	Printed Circuit Board	A-1098	Delta Design	A-1098	
53	R1	1	Resistor, Carbon Comp.	680 ohms ½W, 5%	Stackpole		
54	R2	1	Resistor, Carbon Comp.	820 ohms ½W, 5%	Stackpole		
55	R3	1	Resistor	F.A.	Stackpole		
56	R4	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole		
57	R5	1	Resisotr, Carbon Comp.	560 ohm ½W, 5%	Stackpole		
58	R6	1	Resistor, Carbon Comp.	F.A.	Stackpole		
59	R7	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
60	R8	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
	R9	1	Resistor, Wire Wound	600 ohm CMR 50, 1%	Conrad Carson	A-1056	
62	R10	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
63	R11	1	Resistor, (Potentiometer) 20T, W.W., 20 ohm	200P-1-200	Bourns	A-1099	
64	R12	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
65	R13	1	Resistor	F.A.	Stackpole		
66	R14	1	Resistor, Carbon Comp.	15K ½W, 5%	Stackpole		
67	R15	1	Resistor, Carbon Comp.	1.2K ½W, 5%	Stackpole		
68	R16	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
69	R17	1	Resistor, Carbon Comp.	10K ½W, 5%	Stackpole		
70	R18	1	Resistor, Carbon Comp.	10K ½W, 5%	Stackpole		
71	R19	1	Resistor, Carbon Comp.	10K ½W, 5%	Stackpole		
72	R20	1	Resistor, Carbon Comp.	1.2K ½W, 5%	Stackpole		
73	R21	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole		
74	R22	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
75	R23	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 4 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Mfgh No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
76	R24	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
77	R25	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
78	R26	1	Resistor, Carbon Comp.	680 ohms ½W, 5%	Stackpole		
79	R27	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
80	R28	1	Resistor, Carbon Comp.	680 ohms ½W, 5%	Stackpole		
81	R29	1	Resistor, Wire Wound	118 ohms CMR-50, 1%	Conrad Carson	A-1100	
82	R30	1	Resistor	F.A.	Stackpole		
83	R31	1	Resistor, Carbon Comp.	1K ½W, 5%	Sta'ckpole		
84	R32	1	Resistor, Wire Wound	530 ohms CMR-50, 1%	Conrad Carson	A-1101	
85	R33	1	Resistor, (Potentiometer) 20T, 100 ohm WW	200P-1-101	Bourns	A-1102	
86	R34	1	Resistor, Temp. Sensitive	F.A.	Delta		
87	R35	1	Resistor	F.A.	Stackpole		
88	R36	1	Resistor, Carbon Comp.	3.3K ½W, 5%	Stackpole		
89	R37	1	Resistor, Carbon Comp.	6.8K ½W, 5%	Stackpole		
90	R38	1	Resistor, Carbon Comp.	6.8K ½W, 5%	Stackpole		
91	R39	1	Resistor, (Potentiometer) 20T, 500 ohm WW	275-1-501	Bourns	C-3801	
92	R40	1	Resistor, Carbon Comp.	3.3K ½W, 5%	Stackpole		
93	R41	1	Resistor	F.A.	Stackpole		
94	R42	1	Resistor, Carbon Comp.	27K ½W, 5%	Stackpole		
95	R43	1	Resistor, Carbon Comp.	18K ½W, 5%	Stackpole		
96	R44	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
97	R45	1	Resistor, Carbon Comp.	1.2K ½W, 5%	Stackpole		
98	R46	1	Resistor, Carbon Comp.	5.6K ½W, 5%	Stackpole		
99	R47	1	Resistor, Carbon Comp.	5.6K ½W, 5%	Stackpole		
100	R48	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole		

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 5 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Mk.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
101	R49	1	Resistor, Carbon Comp.	12K ½W, 5%	Stackpole		
102	R50	1	Resistor, Carbon Comp.	1.2K ½W, 5%	Stackpole		
103	R51	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole		
104	R52	1	Resistor, Carbon Comp.	27K ½W, 5%	Stackpole		
105	R53	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
106	R54	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
107	R55	1	Resistor, Carbon Comp.	18K ½W, 5%	Stackpole		
108	R56	1	Resistor, Carbon Comp.	4.7K ½W, 5%	Stackpole		
109	R57	1	Resistor, Carbon Comp.	10K ½W, 5%	Stackpole		
110	R58	1	Resistor, Temp. Sensitive	F.A.	Delta Design		
111	R59	1	Resistor, Power	8.2K 3 W, 5%	Ohmite		
112	R60	1	Resistor, Carbon Comp.	100 ohms ½W, 5%	Stackpole		
113	R61	1	Resistor, Carbon Comp.	100 ohms ½W, 5%	Stackpole		
114	R62	1	Resistor, Carbon Comp.	270 ohms ½W, 5%	Stackpole		
115	R63	1	Resistor, Carbon Comp.	270 ohms ½W, 5%	Stackpole		
116	R64	1	Resistor, Power	8.2K 3 W, 5%	Ohmite		
117	SCR1	1	Silicon Controlled Rectifier	C22B	G.E.	A-1104	
118	Q1	1	Transistor	2N 1535	Motorola		
119	Q2	1	Transistor	2N 1302	Texas Inst.		
120	Q3	1	Transistor	2N 2218	Motorola		
121	Q4	1	Transistor	2N 1302	Texas Inst.		
122	Q5	1	Transistor	2N 1302	Texas Inst.		
123	Q6	1	Transistor	2N 650	Motorola		
124	Q7	1	Transistor	2N 1302	Texas Inst.		
* 125	Q8	1	Transistor	2N 1302	Texas Inst.		

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 6 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

	Ref. No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
*	126	Q9	1	Transistor	2N 1302	Texas Inst.		
	127	Q10	1	Transistor	2N 1302	Texas Inst.		
	128	Q11	1	Transistor	2N 1302	Texas Inst.		
	129	Q12	1	Transistor	2N 1303	Texas Inst.		
**	130	Q13	1	Transistor	2N 1302	Texas Inst.		
**	131	Q14	1	Transistor	2N 1302	Texas Inst.		
	132	Q15	1	Transistor	2N 1302	Texas Inst.		
	133	Q16	1	Transistor	2N 1303	Texas Inst.		
	134	Q17	1	Transistor	2N 1302	Texas Inst.		
	135	Q18	1	Transistor	2N 2218 (A26)	Motorola		
	[illegible]6	Q19	1	Transistor	2N 1302	Texas Inst.		
	137	Q20	1	Transistor	2N 1302	Texas Inst.		
	138	Q21	1	Transistor	2N 1302	Texas Inst.		
	139	Q22	1	Transistor	2N 1302	Texas Inst.		
	140	Q23	1	Transistor	2N 1303	Texas Inst.		
	141		22	Transistor Pads	T1-103	Canseat		
	142		4	Terminal, Solder	1010-2	Cambion		
	143		4	Terminal, Solder	2080-2	Cambion		
	144		1	Anticipator Cover			A 1105	
	145		2	Screw, Pan HD PH	#4-40 x 3/4			
	146		2	Screw, Pan HD PH Nickel Plate	#4-40 x 5/16			
	[illegible]47		2	Screw, Pan HD PH Nickel Plate	#6-32 x 3/8			
	148		4	Nuts	#4-40			
				* Indicates that Q8 and Q9	are matched.			
				** Indicates that Q13 and Q	14 are matched.			

PARTS LIST

TITLE Printed Circuit Board Type 3
Delta Design, Inc. A-1098

DWG. NO. 1137C-4

SHT 7 OF 7

DELTA DESIGN, INC. LA MESA, CALIF.

Appd. Date

Item No.	Ref. Des.	No. Req.	Description	Com'l Pt No.	Mf'r.	Delta Pt. No.	
149		2	Nuts, Nickel Plate	#4-40			
150		2	Nuts, Nickel Plate	#6-32			
151		2	Washer, Flat, Nickel Plate	#6			

(47)

DELTA DESIGN, INC.

MK 7600 SERIES TEMPERATURE CHAMBER

ENCLOSURES:

(1) 1 ea. MK 6300-H Basic Instruction Manual

(2) 1 ea. MK 7600 Series Specification Sheet

(3) 1 set Characteristic Curves, MK 7500-7600 Series

Fig. 2 Heat Up Characteristics, MK 7500-7600 Series

Fig. 3 Self Heating Characteristics, MK 7500-7600 Series

Fig. 4A Cool Down Characteristics, MK 7500-7600 Series

Fig. 5 Cooling (No heat or coolant being used) MK 7500-7600 Series

Fig. 6 No Heat - No coolant characteristics, MK 7500-7600 Series

(4) 1 ea. Schematic Diagram MK 7600, Temperature, 1222C-3.

(5) 1 ea. Parts List, MK 7600 Series Temperature Chamber, 1222A-4.

(6) 1 ea. Blower, Heater, Valve removal instructions.

(7) 1 ea. De-Icer Schematic 1297A-3

(8) 1 ea. Characteristic Curve, Fig. 4B LN_2 consumption.

The basic instruction manual contains valuable information relative to temperature chambers in general and to the MK 6300-H Series in particular.

The enclosed specification sheets, characteristic curves, schematics and parts lists apply specifically to the MK 7600 Series and should be used instead of those in the manual.

176-01

(47)

MK 7600 CHAMBER SPECIFICATION SHEET

TEST AREA DIMENSION: 20" x 20" x 25"

OUTSIDE CASE DIMENSION: 32 1/4" x 34 1/4" x 33 1/2"

AIR CIRCULATION: Six 140 CFM centrifugal blowers with baffling to provide equal distribution throughout the chamber in a horizontal air flow pattern.

INNER LINER: Type 302 stainless steel

OUTER CASE: Aluminum

EXTERNZL FINISH: Grey, pebble enamel

INSULATION: Fiberglas

WEIGHT: 265 Lbs.

POWER REQUIREMENT: 4.75 KW, 240V 60 cycle single phase AC

CONTROLS: Power ON-OFF switch and indicator light, COOL ON-OFF switch and indicator light, HEAT ON-OFF switch and indicator light, temperature set point control, local or remote control switch (Mode).

HEATING ELEMENTS: Dual 720 W elements to give total of 4300 watts nichrome wire.

COOLING: Liquid CO_2 metered injection (900 psi standard, 300 psi optional) or liquid nitrogen.

PROGRAMMING: Chamber requires no modification.

COOL DOWN TIME: 8 min. ambient +o to -65°F.

HEAT UP TIME: 24 min. ambient to +425°F.

TEMPERATURE RANGE: --300°F to +600°F for LN_2 models.

RESETABILITY: $\pm$ 0.25°F.

TEMPERATURE DEVIATION: $\pm$ 0.2°F.

CONTROLLER DEAD-BAND: 3°F

LINE VOLTAGE STABILIZATION: $\pm$ 0.5°F for 105 to 125V, AC 60 cycle line voltage change.

76-02

47

MK 7600 SPECIFICATION SHEET

AMBIENT TEMPERATURE COMPENSATION: ± 0.02°F/°F

GRADIENT IN TEST AREA: (1-1/2" from walls in corners and in the center of the test area) ± 1-1/2°F/100°F difference, measured from ambient.

HEATING RATE: See Figure 2

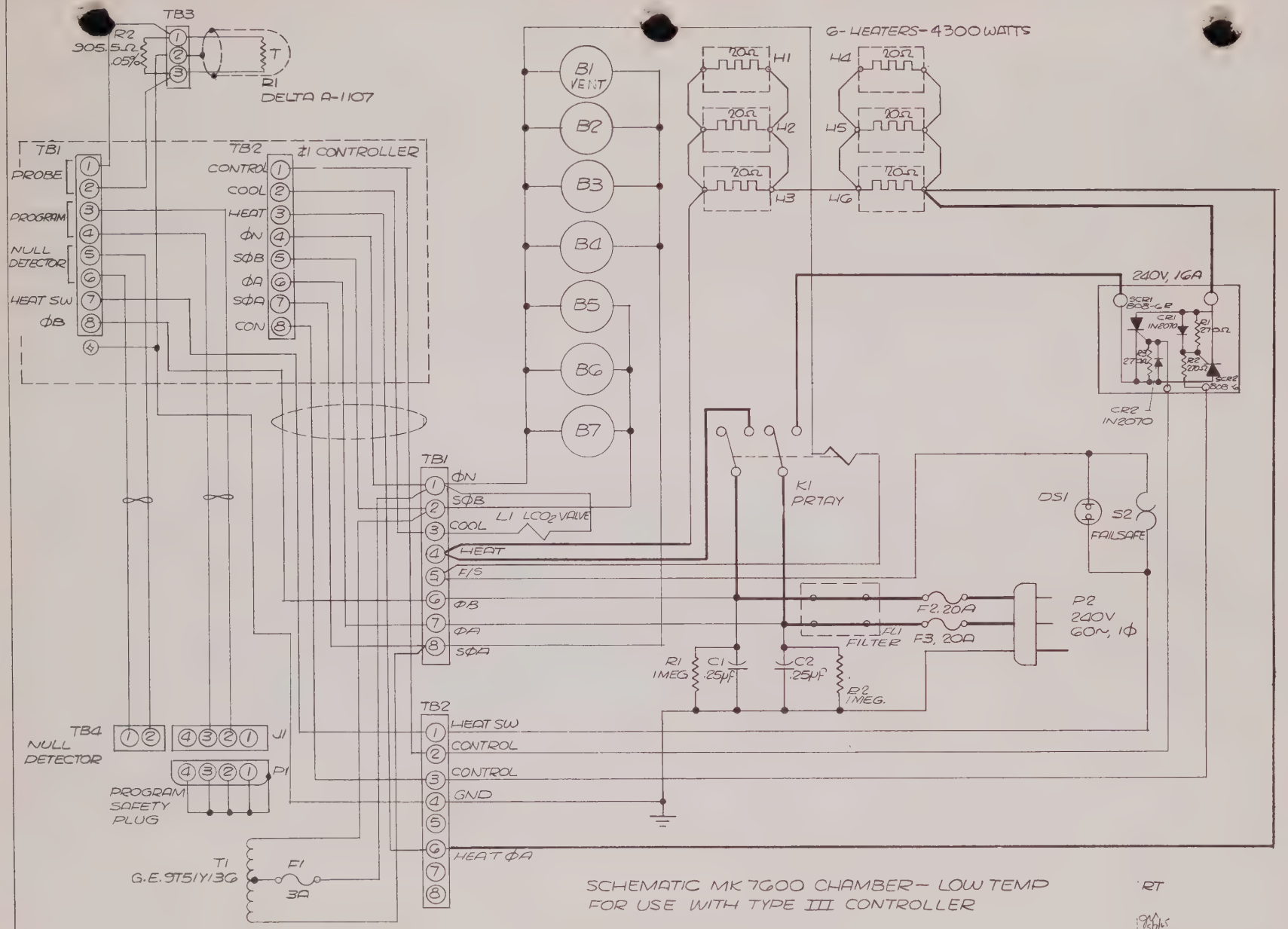
COOLING RATE: See Figure 4

CO_2 CONSUMPTION: See Figure 4

THERMAL IMPEDANCE OF CHAMBER: Approximately 0.275°F/Watt.

NULL DETECTOR CONTACT CLOSURE: Temperature will be within 4°F of final temperature at 3 min. after closure occurs. (425°F from ambient start).

NULL DETECTOR CONTACT RATING: 1 amp, 240V, with contact protection provided by user to protect against inductive loads.



SCHEMATIC MK 7600 CHAMBER – LOW TEMP
FOR USE WITH TYPE III CONTROLLER

RT

2/24/65

MK 7600 CHAMBER WITH TYPE III CONTROLLER

SERIAL Nº 5201 & ON

1222C-3

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SERIAL NO 5201 & ON

PARTS LIST

TITLE MK 7600 SERIES 240 V SYSTEM FOR USE WITH TYPE III CONTROLLER

DWG NO. 1222A-4

SHT 1 OF 3

DELTA DESIGN, INC. LA MESA, CALIF.

APPD DATE

DASH NO.	REF DES.	NO. REQ	DESCRIPTION	COML PT NO	MFR.	DELTA PT NO.	
1			SALES OUTLINE				
2			FABRICATED PARTS LIST				
3			SCHEMATIC				
4			PARTS LIST				
5			WIRING SCHEDULE				N/A
6			WIRING DIAGRAM				N/A
7			MECH & ELEC ASSY				N/A
8	B1	1	BLOWER, VENT	WS2107F	I.M.C.	A1032	
9	B2	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C2502	
10	B3	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C-2502	
11	B4	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C-2502	
12	B5	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C-2502	
13	B6	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C-2502	
14	B7	1	BLOWER MOTOR	140CFM	DELTA DESIGN	C-2502	
15	C1	1	CAPACITOR, PAPER	.25MF	CORNELL DUBILIER		
16	C2	1	CAPACITOR, PAPER	.25MF	CORNELL DUBILIER		
17	DS1	1	INDICATOR LAMP ASSY	TYPE 3	AMP	A-1112	
18	F1	1	FUSE, 3AMP	3AB3A	LITTLEFUSE	A-1094	
19	F2	1	FUSE, 20 AMP	3AB20A	LITTLEFUSE	A-1176	
20	F3	1	FUSE, 20 AMP	3AB20A	LITTLEFUSE	A-1176	
21	FL1	1	FILTER, LINE	20 AMP	DELTA DESIGN	C-1603	
22	H1	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000	
23	H2	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000	
24	H3	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000	

76.12

(48)

SERIAL NO. 5201 & ON

PARTS LIST

TITLE MK 7600 SERIES 240V SYSTEM FOR USE WITH TYPE III CONTROLLER

DWG NO. 1222A-4

SHT 2 OF 3

DELTA DESIGN, INC. LA MESA, CALIF.

APPD DATE

DASH NO.	REF DES.	NO REQ'D	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.
25	H4	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000
26	H5	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000
27	H6	1	HEATER ASSY	20 OHMS	DELTA DESIGN	C-2000
28	J1	1	CONNECTOR	91PC4F	AMPHENOL	K-1202
29	K1	1	RELAY	PR7AY	POTTER BRUMFIELD	A-1179
30	K2	1	RELAY	1140-45-82	ADLAKE	C-2809
31	L1	1	VALVE & INJECTOR ASSY	900 PSI	DELTA DESIGN	~~A-1255~~
32	OR		VALVE & INJECTOR ASSY	300 PSI	DELTA DESIGN	~~A-1279~~
33	P1	1	PLUG, SAFETY		DELTA DESIGN	A-1010
34	P2	1	POWER CORD ASSY	12/3CSO 600V	DELTA DESIGN	A-1054
35	R1	1	PROBE	56F11F	LEWIS	A-1107
36	R2	1	RESISTOR, W.W.	905.5 OHMS .05%	CONRAD CARSON	A-1055
37	R3	1	RESISTOR, CARBON COMP	1 MEG, ½W, 5%	STAKEPOLE	
38	R4	1	RESISTOR, CARBON COMP	1 MEG, ½W, 5%	STAKEPOLE	
~~39~~	S1	1	SWITCH, S.C.R.		DELTA DESIGN	~~A-1118~~
40	S2	1	THERMOSWITCH	TD1C22-4	CALSTAT VULCAN	A-1083
41	T1	1	TRANSFORMER	9T51Y136	G.E.	A-1174
42	TB1	1	TERMINAL BOARD. 8 POS	699-8	KULKA	A-1109
43	TB2	1	TERMINAL BOARD. 8 POS	699-8	KULKA	A-1109
44	TB3	1	TERMINAL BOARD. 3 POS	3-140	CINCH JONES	A-1057
45	TB4	1	TERMINAL BOARD. 2 POS	2-140Y	CINCH JONES	A-1111
46	XF1	1	FUSEHOLDER	342012	LITTLEFUSE	K-1501
47	XF2	1	FUSEHOLDER	342012	LITTLEFUSE	K-1501
48	XF3	1	FUSEHOLDER	342012	LITTLEFUSE	K-1501

(48)

SERIAL NO 5201 & ON

PARTS LIST

TITLE MK 7600 SERIES 240V SYSTEM
FOR USE WITH TYPE III CONTROLLER

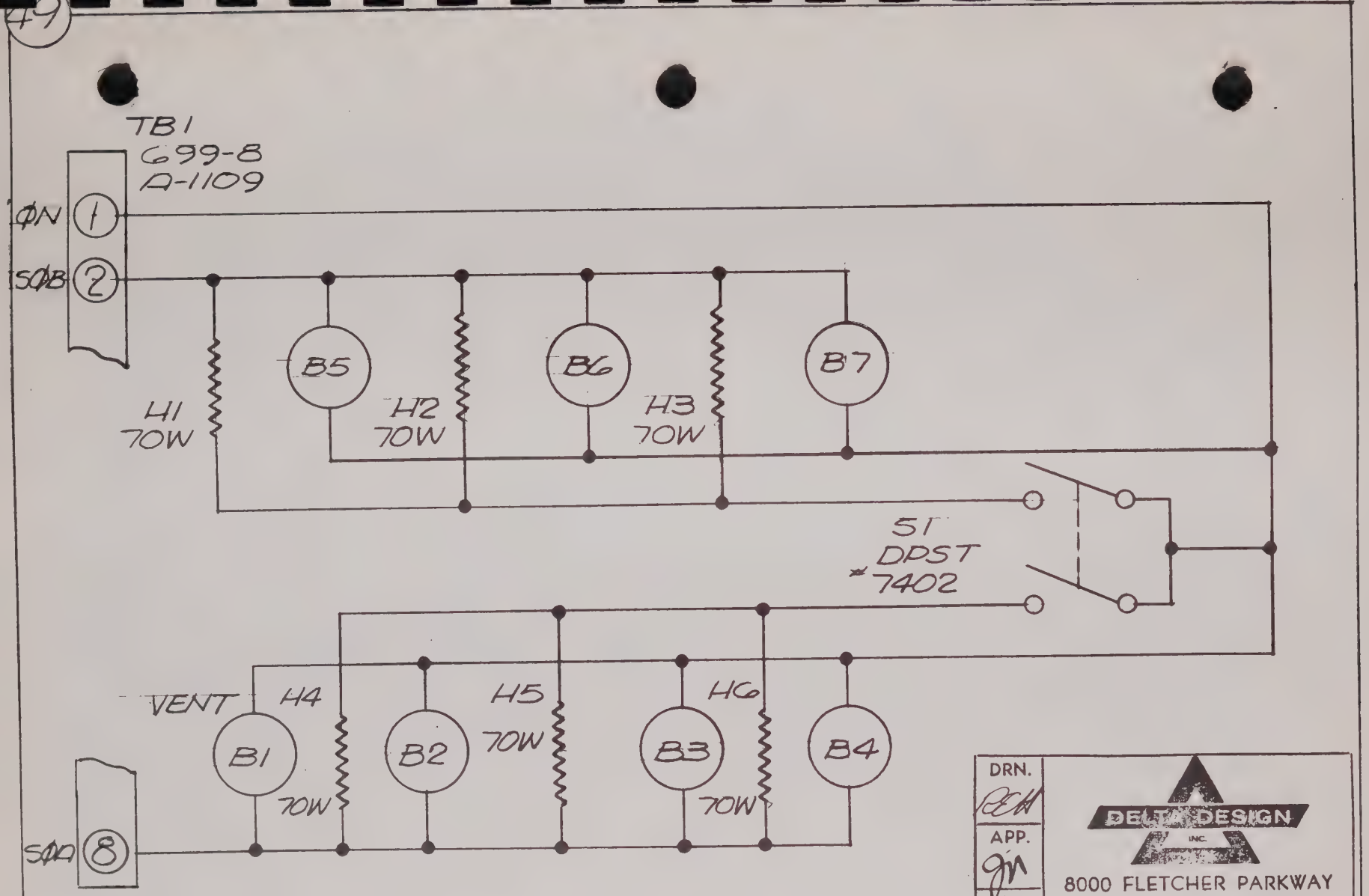
DWG NO. 1222A-4

SHT 3 OF 3

DELTA DESIGN, INC. LA MESA, CALIF.

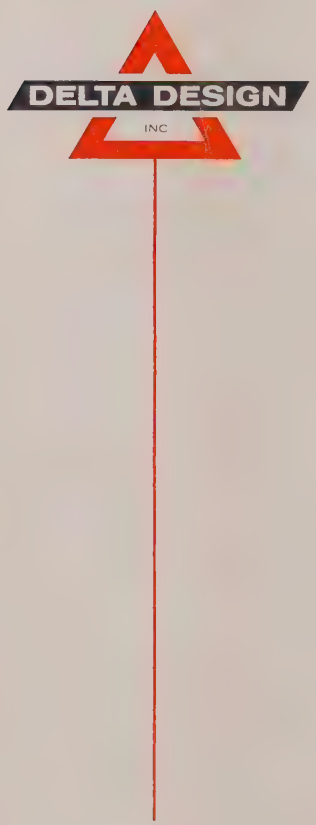
APPD DATE

DASH NO.	REF DES.	NO. REQ	DESCRIPTION	COML PT NO	MFR.	DELTA PT. NO.	
49	1	Z1	CONTROLLER, °F		DELTA DESIGN	A-1234-1	
50	1	Z2	CONTROLLER, °C		DELTA DESIGN	A-1234-3	
51	1	LN1	LN_2 INJECTOR ASSY		DELTA DESIGN	A-1372	



DE-ICER FOR MK G300F, 7500, & 7600 BLOWERS USED AT -300 °F

DRN.	DELTA DESIGN INC.
APP.	8000 FLETCHER PARKWAY LA MESA, CALIF.
DATE 7/20/65	NEXT ASSY.
TITLE	DE-ICER FOR MK 7600 BLOWERS
DWG. NO.	1297A-3



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